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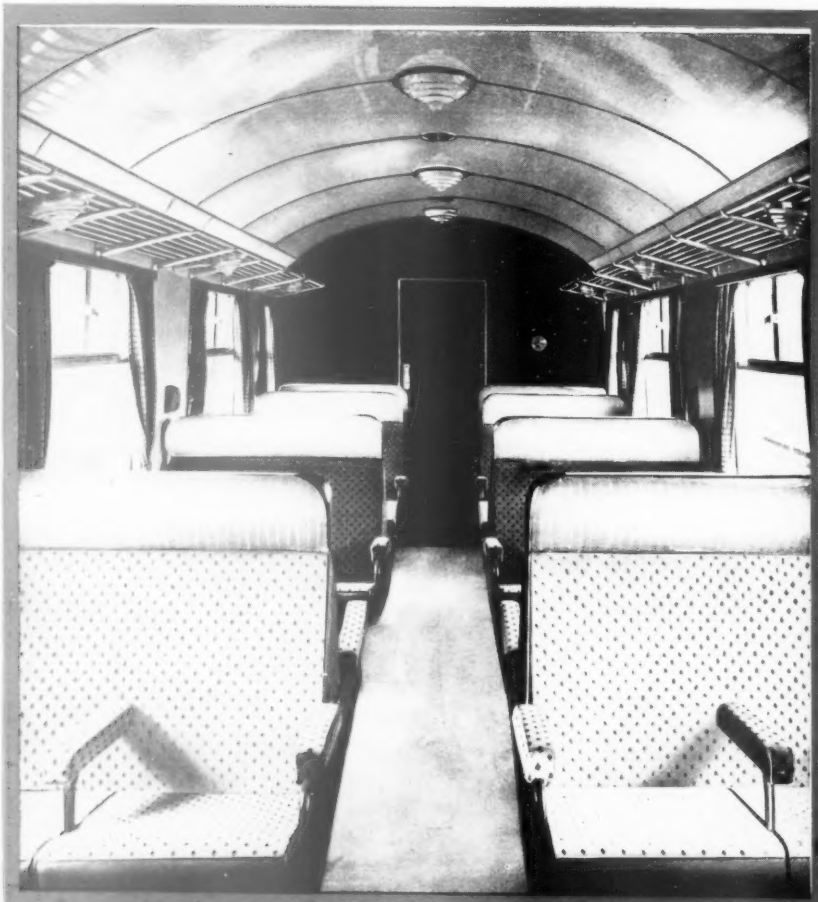

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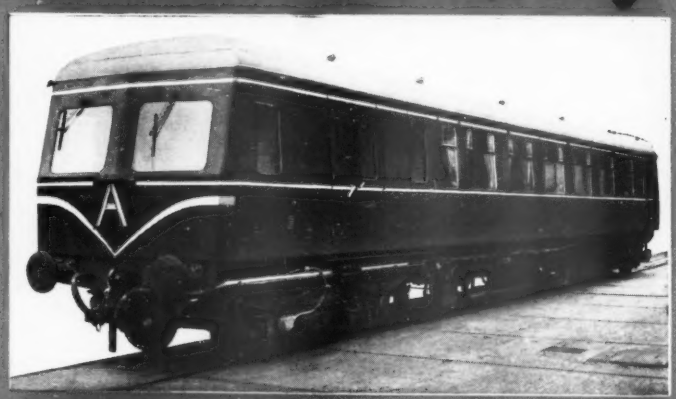

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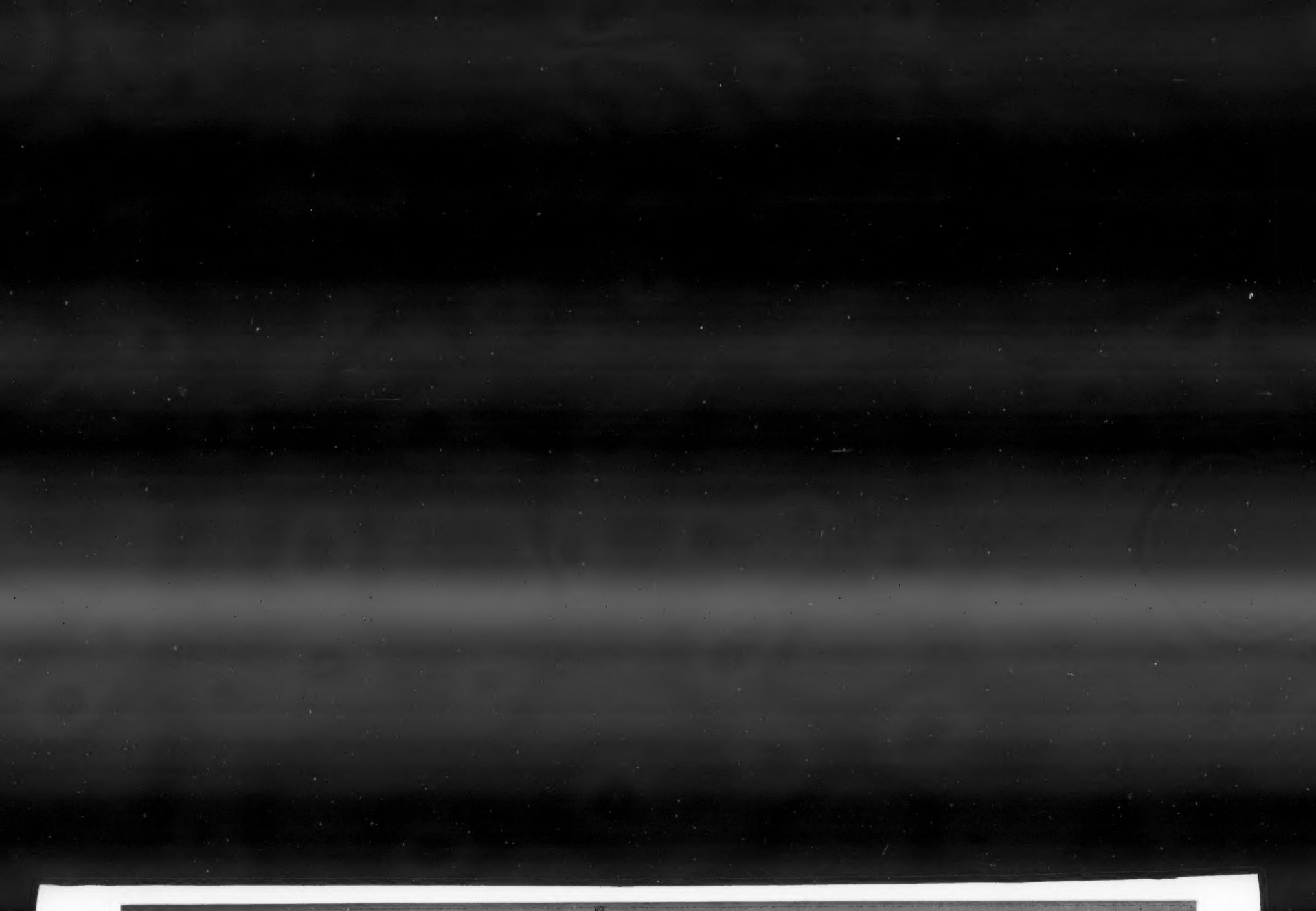

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Railway Material for South America

GREAT possibilities are offered by the potential markets for railway material in South America, where expansion and prosperity are now running, rather than walking, hand in hand in some of the republics, such as Venezuela, where an underground railway for Caracas is under consideration, and many of the others are embarking on programmes of railway development. The grip of British exporters on these countries, though never entirely lost, has tended to be insecure in recent years, and many criticisms have been levelled at their failure to keep pace with South American needs, though in the sphere of railway material exports there have been notable successes, more particularly in Brazil. A chance to re-establish connections in Argentina is offered by the signing in London last Tuesday of the long-awaited agreement for the provision of a £3,500,000 credit by Baring Bros. & Co. Ltd., representing a group of British banks. This is to be applied to the purchase of spare parts for steam locomotives. It is understood that one of the conditions of the credit is that orders will be placed in the United Kingdom within three months. A report from Buenos Aires states that although the credit is limited to £3,500,000, this will enable £5,000,000 worth of equipment to be bought. Ten per cent of the value of the contract would be paid on placing the orders, 10 per cent against delivery of shipping documents, 68 per cent would come from the credit, and the remaining 12 per cent would be provided on credit by the British exporters, no doubt with cover provided by the Export Credits Guarantee Department. The credits would be repaid in six half-yearly instalments. Another country which badly needs improvements to its railway system is Uruguay, which in 1953 applied to the International Bank for Reconstruction & Development—so far without results—for loans amounting to Ur $29,425,000 to finance railway re-equipment. The Uruguayan State Railways placed orders for 64 diesel-electric locomotives in 1951-53 with manufacturers in the U.S.A., a purchase financed by the Export-Import Bank, and in the same period bought small quantities of passenger coaches from Holland and motor coaches from Austria, but since then the only railway purchases seem to have been 300 wagons from Japan, financed by a quasi-barter arrangement involving exports of rice to that country. Unless the International Bank grants the loan required, it is hard to see how Uruguay can finance railway developments, but undoubtedly, if the money could be found, there is an opportunity which manufacturers in this country cannot afford to neglect.

New East African Loan

FOR its new loan, the list of applications for which opened and closed yesterday, the East Africa High Commission has felt it necessary to offer the high return, for a gilt-edged stock, of 5¾ per cent. The total issue of stock, dated 1977/83, is £11,500,000, of which £8,500,000 refers to railways and harbours and £3,000,000 to posts and telecommunications. The East African Colonial Governments have taken up £1,500,000 of the first part and £500,000 of the second, so that £9,500,000 was actually offered for subscription yesterday. The railway portion of the loan, which is to be used for financing general improvements and purchasing rolling stock, will be welcome as enabling important works to be carried out by the E.A.R. & H. but is a considerable addition to the interest-bearing items on the capital account, which, at the end of 1956, stood at £48,900,000. The terms, attractive as they must be to investors, are a greater burden on the E.A.R. & H. than the 5½ per cent at which a nominal amount of £3,500,000 was raised in London last year, although this was raised at £98½ and the new stock was offered at par. The better terms offered yesterday were doubtless, at least in part, influenced by the comparatively large amount of money required.

Financial Aid for Mexican Railways

THE credit of $23,000,000 authorised by the Export-Import Bank last week for the National Railways of Mexico will be of great assistance in the modernisation of track and rolling stock which is being undertaken. Mexico looks towards its northern neighbour, the United States, for much of its railway equipment and many of its working methods, but there is a substantial trade between Mexico and the United Kingdom, particularly in machinery, with the balance of trade in Britain's favour, so that a determined drive by manufacturers of railway equipment, backed by suitable credit terms, should produce results. The close ties with the U.S.A., however, undoubtedly make this a difficult market to enter. If it can be done it will be well worth while, for Mexico is the fifth largest country of the American continent and has an extensive railway system, with new construction in progress, besides modernisation of existing plant. British enterprise, it will be remembered, played an important part in building Mexican railways.

Railway Expansion in Africa

CECIL RHODES' dream of a Cape to Cairo railway may not be realised for some years, if only because economic considerations may not yet justify rail links between the Sudan Railways and those of Egypt, northwards, and the East African Railways to the south, and

river and road connections between the Sudan and Egypt and Uganda already exist. With the economic development of Africa, however, a through north-to-south railway seems bound to come in time, though a formidable problem of differences in gauge will have to be solved if physical connection is made with the 4-ft. 8½-in. gauge Egyptian lines. Meanwhile, railway expansion in West, East, Central, and South Africa is taking place at a speed which might have gone far to satisfy even Rhodes—after a lull between the world wars. The possibilities of through railway transport in the southern half of the continent are vividly shown in maps issued by the Benguela Railway Company, the subject of a notice on another page.

Transcontinental Railway Links

THE principal railways in the Union of South Africa, Rhodesia, Nyasaland, Mozambique, Angola, and the Belgian Congo inter-connect and share the same 3 ft. 6 in. gauge. Provision has been made in new rolling stock for the metre-gauge East African Railways for conversion to 3 ft. 6 in. gauge when the physical links are established, as they must be before long, with the extensive "Cape gauge" network; this would be by a route under consideration between Tanganyika and Northern Rhodesia, or perhaps through the Belgian Congo. Railway development in West Africa tends at present to be confined to individual territories of the British Commonwealth and French Union, although the building of the Mediterranean-Niger Railway across the Sahara is an active question, and an east-west route to the Sudan is understood to be envisaged. Whatever the political future of the countries of Africa, most of them offer considerable scope for building new, and improving existing railways with the aid of new developments, more particularly in mechanical, electrical, and signal engineering—opportunities which should be grasped by the railway industry of this country.

A New Station Handbook

THE new edition of the Railway Clearing House official Handbook of Stations, the first since 1938, reflects the many changes in the railway scene brought about by the war and its economic aftermath. Despite the use of larger and clearer type—partly offset by a larger page size—the new handbook runs to 494 pages only, compared with the 654 of its predecessor. Nothing could show more clearly the extent of concentration of traffic and closing of unremunerative stations that has been undertaken by the railways. The code letters for types of station accommodation remain substantially the same as in the previous edition, though at the expense of some archaic touches, such as category "C"—"Carriages and Motor Cars." The usefulness of the handbook, established over many years by generations of users, remains unimpaired, and only the rapid changes in the organisation of railways in Britain since the war has delayed this edition for so long. Consignees who habitually send large quantities of merchandise by rail will find this new edition as essential as will the railway goods clerk. The list of undertakings, in which names such as the Taff Vale and the East & West Yorkshire Union live again, shows the extent to which the old nomenclature is still used in daily railway working.

Wagons for Steel

THE consultation between the British Transport Commission and the iron and steel industry on wagon design is being continued in the case of the 22-ton wagon which, for the time being at least, is to serve instead of the standard 24½-ton wagon, particularly for coal traffic. The 24½-ton wagon, which has had some considerable success, cannot be adapted on as wide a scale as would be desirable because many collieries and works are not yet equipped to receive it. As the British Iron & Steel Federation reveals in its annual report for 1956, there have been delays in wagon building for the steel industry, and of the 900 25½-ton ironstone hopper wagons in the 1956 programme only 360 went into service last year. Similarly, only 350 of the 450 20-ton coke hopper wagons were completed. There are hopes, however, that the balance of the ironstone wagons will be delivered this year with an extra 1,150 such wagons. Deliveries of the 500 27-ton ironstone tippler wagons planned by the Commission for 1956 were postponed, but some have been delivered this year. The shortage is being remedied by the use of 16-ton mineral wagons as a temporary measure. As far as steel-carrying wagons are concerned, the building programme for 1956, involving some 4,400 new wagons, was fully carried out during the year.

Large-Scale Application of C.T.C.

FOR many years the New York Central System main line between New York and Chicago had an unbroken 342·5 miles of quadruple trackage from Castleton-on-Hudson, New York, to Dunkirk, New York, the longest four-track stretch in the world; with the construction of a fourth main track at Dunkirk in 1940, the unbroken quadruple trackage was extended to Collinwood, near Cleveland, Ohio, making a total of 473·75 miles of unbroken quadruple main line. For reasons of economy in operation and as a result of the installation of C.T.C. between Buffalo and Cleveland, Ohio, with 163 miles of double track so controlled, New York Central Line's longest stretch of continuous mileage of four track has been reduced to 116·4, extending from Hoffmans, near Schenectady, to East Syracuse, New York. The C.T.C. installation between Buffalo and Cleveland is the first phase of an extensive programme and is believed to represent application of C.T.C. to double track on a larger scale than anywhere else in the world, as other large C.T.C. installations have been on single track. Additional installations are now in progress along the main line, and it is expected that by 1963 C.T.C. will govern the entire main line from New York City and from Boston to Chicago by way of the Western District.

Dual Traction Systems at Basle

WITH completion of the electrification of the French National Railways Strasbourg-Basle main line, scheduled for this autumn, operation at Basle S.B.B. Station will require the interworking of two electric traction systems: the existing 15,000-V., 16⅔ cycles system of the Swiss Federal Railways, and the 25,000-V., 50-cycle, system of the S.N.C.F. Both administrations have now agreed on the details of the technical arrangements to be made at Basle. Three platform roads on the French side of the station and certain tracks used for goods trains will be equipped for 25kV., 50 cycles only. A number of points and crossovers just west of the station, which is much used for shunting movements, also a fourth platform road, are to be equipped for alternative use, so that it is available for Swiss and German besides French locomotives. If the tracks thus equipped are required for passenger train movements, the appropriate traction current must be switched in before the movement can be authorised. Shunting, however, will be carried out by dual-equipped locomotives with automatic switchover to whatever type of current the pantograph happens to be in contact with.

Overcoming the Difficulties at Cannon Street

A GREATLY improved train service is being introduced this weekend with the bringing into service at Cannon Street, Southern Region, of the temporary power signalbox which, although not as large as that destroyed on April 5, will enable five of the eight platforms to be used under full signal protection and a few trains to be worked from another. Two diesel-electric trains will provide certain main-line services, as outlined in the article on page 519, but steam trains involving locomotive shunting, will remain diverted. Certain of them will now run, however, to Charing Cross, with others to Victoria, pending more complete facilities becoming available. The provision of these is being urged forward by every means

possible. A new signalbox is to be erected to the south of the station and will, of course, be of the most up-to-date design in every respect and quicker in operation than the one destroyed, which was some 30 years old. The calamity is on a level with that suffered in the war when the Blackfriars Junction power box was totally destroyed and a temporary one had to be provided, entailing a like degree of anxiety and additional work for the Signal Engineer and his staff, who also have had to work continually since the incident, and to whom in this instance a tribute is equally due.

Beyer-Garratt Locomotives for Rhodesia

THE importance of railway development in Rhodesia was stressed by Sir Gilbert Rennie, High Commissioner for the Federation of Rhodesia & Nyasaland, during a visit to the Gorton Works, Manchester, of Beyer, Peacock & Co. Ltd., to inspect the "20A" class locomotives under construction there for the Rhodesia Railways; a short account of the visit is given elsewhere in this issue. Between 1949 and 1956, he pointed out, traffic carried by the railways in Rhodesia had increased by more than double, and the "20A" class Beyer-Garratt locomotives, 46 of which were being built, would be a most valuable addition to the motive power required by the railway to move the constantly increasing traffic. In design, the "20A" class locomotives are basically similar to the "20th" class Beyer-Garratts described in our issue of January 28, 1955, the main difference being in the outer bogie wheels, which have been increased to 2 ft. 9 in.; there is also a slight increase in coal capacity. Standard mechanical stokers are fitted, and the locomotives are not dependent on imported fuel, as they have been designed to burn coal from the Wankie Collieries. On completion of the present order, the Rhodesia Railways will have been supplied with a total of some 250 Beyer-Garratt engines.

Building Locomotives for British Railways

THE action of the Government in amending the Electricity Bill to restrict the manufacturing powers of the proposed Central Electricity Generating Board to what might be needed for research, development, or repair, was the occasion for our drawing, in an editorial article in our April 12 issue, the parallel between the Central Electricity Generating Board and British Railways as regards new construction of plant and motive power respectively. We commended the Government for having at last given positive recognition in the Electricity Bill to the importance of a secure home market for the industries concerned, and we expressed our view that a home market for the British locomotive building industry could be established likewise if the British Transport Commission adopted the policy of obtaining its new motive power from private industry in this country. This view was developed in the article, in which we were at pains to show how a policy of benefit to the national economy could be implemented with the minimum of hardship to employees of British Railways.

Last week, *The Railway Review*, the organ of the National Union of Railwaymen, devoted much space to criticising in an article "Loco Building Should Not Be Left 'Private'" what it seemed to think that we had said. It is very seldom that that journal has occasion to join in controversy with us, for it tends, rightly, to confine itself to questions of detail affecting the remuneration and conditions of work of N.U.R. members; it might in this instance have desisted from discussing a matter of which it displays such a lamentable lack of knowledge.

In the first place, *The Railway Review* refers to us as "seemingly speaking on behalf of private manufacture." Partisan editorial may be necessarily a part of the *Review's* function, but we should have thought that anyone who read our pages with reasonable application would have realised that as a journal of "management, engineering and operation" we are independent, as we show ourselves to be in criticising, from time to time, railway administrations or managements or private manufacturers of railway material. Sometimes, as recently in the matter of late deliveries, we have criticised the British makers of railway material; and sometimes, as on this and many previous occasions, we have advocated that private industry should be supported by affording a stable home market because that is in the best interests of the national welfare, of British Railways, of the private builders, of the overseas railways to whom locomotives are supplied—and, not least, of the many people who gain their livelihood directly and indirectly, from the railways and the industries that supply them, whether railwaymen or employees of locomotive manufacturing firms. *The Railway Review* is also, and not for the first time, loose in its wording: "Just as the Government has restricted the . . . Electricity Board," it states, "so that the manufacture of heavy plant can be left in the hands of private builders, so, said the *Gazette*, should similar restrictions be placed on the British Transport Commission." As we went to some length to explain that only purely voluntary action by the Commission was needed to bring about the change of policy, this sort of misquotation is disheartening.

More important are the serious misconceptions. *The Railway Review* argues that the overseas market is so specialised and the conditions so different from those at home that the home market is of no technical value. This shows extraordinary ignorance not only of elementary facts concerning the locomotive industry, but also of railway working generally. As to the latter, any engineman with experience on railways both at home and abroad, say, on war service, can point to the basic similarities between all steam, or between all electric, or between all diesel-electric locomotives, wherever they may work; and the conditions peculiar to railways overseas are well known to the British builders with their wealth of experience.

It is utter nonsense to state, as does *The Railway Review*, that if private manufacturers need to "practise" on British engines—a clumsy expression—then they have no right to be in business at all. All exporting industries, and more particularly the capital equipment industries, need a stable and assured market to facilitate planned production and keep down overheads. Such a market, moreover, is a good shop window. For a number of reasons British Railways are the object of attention of railway managements all over the world; there could be no better means of displaying British railway material in action than its use on British Railways—as indeed is the case with many items of signalling and other equipment supplied by private industry. The importance of this home market is grasped not only by British machine tool and other industries which export, but—what is more significant—by the railway managements in Germany, Japan, France, the U.S.A. and other countries in which private industry exports railway motive power and also supplies the home market.

In suggesting that the small proportion, 10 per cent (indeed we believe it to be much less), of the capacity of British Railways shops at present devoted to new construction shows that the potential new construction, if entrusted to private industry, would be small, and in asking "Are we to believe that a healthy home market depends on that 10 per cent?" our critics show extraordinary lack of reasoning powers. Obviously, 10 per cent of the shop capacity of the biggest railway system in the world is a large item compared with the capacity needed for satisfying even a gratifyingly large series of orders for overseas railways and it is 100 per cent of the home market; but it is only marginal in relation to the total capacity of British Railways' own shops, which facilitates the abandonment of new construction therein.

The opinion is expressed by *The Railway Review* that the railway managements in the early days adopted the policy of building in their own works because, with the many patents in the hands of the private builders, the

construction of locomotives exclusively by them would make impossible an adequate degree of standardisation and the ensuing economies. One can only look at the U.S.A., the pioneer of standardisation in railway material, where motive power and rolling stock are supplied by private industry, to see how false the argument is. In fact, the British railways began to build their own engines largely because, with the growth of the overseas markets, the private builders could not cope with the increasing demands of the home railways, and also because it was considered—but has never been proved—that the products of the railways' own works would be cheaper. The analogy drawn between American motorcar and locomotive industries, and the suggestion that American practice is not to repair railway motive power units, but to replace them quickly is fantastic, in the light of the heavy expenditure by U.S.A. railways on repair facilities for diesel locomotives.

Finally, our contemporary refers to a struggle between the Commission and private railway equipment manufacturers, "waged on the amount of new business forthcoming for the private manufacturers," and to "the other struggle," on the merits of the different types of motive power. We cannot believe that any such "struggle" is taking, or has taken, place. All concerned, we believe, are fully aware of the importance of co-operation and of the need for pooling resources where this is practicable within the framework of the commercial policy adopted. Obviously opinions differ on matters such as electrification, as they are bound to differ amongst alert minds. The Commission is stated by *The Railway Review* to be "very well aware of the advantages of the traditional way," that is, of manufacture by the railways of their own new motive power. Opinions must differ in the Commission, as elsewhere; and there is a natural reluctance to alter policy. There are, we believe, a good many who have not been fully seized of the advantages of the course we have advocated, and continue to advocate, of entrusting new construction to private industry. It is for that reason that we expressed our views in the article.

Caution on the Channel Tunnel

THE delays experienced by cross-Channel passengers at the French ports on returning from Easter holidays on the Continent due to inadequate shipping accommodation give added point to the revived interest in the construction of a tunnel under the Channel. This sudden resurrection of a century-old idea is due to a number of reasons, but mainly to the interest of American businessmen and engineers in financing the venture and which has led the Suez Canal Company, seeking further outlets for its curtailed activities, to evoke interest also. In Parliament an all-party committee has come to life with a view to keeping in touch with developments. It should not, however, be accepted that this revived interest in the project indicates either complete acceptance in principle of the desirability of building the tunnel, or of its practicability and claimed economic potentialities without considerable further study. It is therefore good news that the first step towards obtaining more information has been taken along the right lines, namely to undertake a comprehensive study of the geological structure of the Channel and of the major technicalities of its construction. Equally important is the compiling of economic reports on the repercussion of a direct railway link with the Continent and comprehensive studies of potentialities of passengers, freight and motor vehicle traffic. It will be necessary to estimate the proportion of traffic likely to be diverted from existing cross-Channel transport, and the amount of the new traffic created. This is no easy task, particularly in view of the increasing air traffic against which the rail and sea routes find it difficult to hold their own. When it comes to financial returns estimates will be even more difficult to compile. The cost of the tunnel is variously estimated between £100 million and £250 million according to whether it is confined to rail or includes both rail and road. With interest rates at high levels—and Americans presumably would not finance the project unless they were assured an adequate return on capital invested—and with such diversion of traffics from other routes, the net revenue gain is highly problematical. It is essential therefore that these studies be completed with all seriousness before high hopes are encouraged of a speedy construction of the tunnel. In any case it is a long-term project. The study now contemplated will take a year or more. A pilot tunnel from three to five years to build and the tunnel itself certainly no less. The most reasonable estimate would therefore be that it may well be a decade before holiday makers can enjoy journeying to their continental destination in through train comfort.

These, no doubt, are among the reasons why members of the Parliamentary Committee have decided to proceed cautiously and decided to call for a fresh appraisal of the problems involved, technical, political, and economic, before formulating any policy or engaging in pressure politics to force Government support of the project. In principle, all accept that the tunnel has considerable advantages which probably outweigh the disadvantages, but its control and operation is of great importance. There is no ready acceptance of its exclusive financing with American money. If there were such participation, adequate assurances that final control rests with the British and French Governments is necessary. Such was the view of the earlier Parliamentary Committee which appointed a study group in 1947 to prepare a report and which reached the conclusion that in view of the nationalisation of both the French and British railways the project should be undertaken on a national basis. Such is likely to remain the Parliamentary view and it is not irrelevant that the Government has a large shareholding in the Suez Canal Company which is showing its interest in the tunnel's construction. Unquestionably no Labour Government would consider anything but joint Government ownership of the tunnel, either direct, or indirect through the nationalised railways.

The proposal for a common market for Europe, and Britain's association with it through a free trade area, is another reason for the revival of interest in the tunnel, which apparently stimulated Parliament's interest. At first it was considered that unless the handicap of the Channel, involving transhipment of goods from rail to sea and ship to rail or road, except for the small though increasing quantity that goes by train ferry, were removed, this country would be at a disadvantage in competing in the European free trade area. That is true, but it has come to be realised increasingly that easier and cheaper transport to and from Britain would work both ways. Many industrialists fear that the removal of protection against imported goods from the Continent—and Britain is in comparison still a high-tariff country—will flood the British market and damage their trade. The tunnel will certainly facilitate this, and some industries, notably textiles and motorcars, may suffer. It would, however, be a short-sighted policy if the tunnel being proved practical and economic the Channel barrier as a protection against Continental competition were deliberately retained and the tunnel not proceeded with.

There is a further consideration, and that is the question of priorities. However desirable may be the removal of the inconvenience of the Channel barrier, the cost of the tunnel would be so great and the time before benefits would accrue so long that granting it priority at the expense of other much-needed investment in the transport field is bound to be questioned. The British Railways modernisation programme is now under way and is certain to cost, within the next 10 years, more than the £1,200 million estimated. It could well be that a speeding up and extension of this programme, particularly as regards electrification, would reap more dividends than the tunnel. The same can be said of the roads, the programme for which, in view of the increasing number of vehicles being turned out, is quite inadequate to modern requirements. For these reasons the grand vision of streamline electric trains speeding under the Channel at 100 m.p.h. and motor cars rushing bumper to bumper at holiday peak may be

enjoyed by the imaginative; but its realisation will be cautiously examined and not rushed at by the practical realist.

British Railways Finances

FROM time to time the cry is raised, by people who might be expected to know better, that British Railways are incurring alarming losses which are being met from the pockets of the taxpayer, who, because of the vague terms of accountability of nationalised industries to the State, have no redress. Because it is easier to command popular attention by decrying public institutions in this country than by defending them, these wild statements receive much more publicity, especially in the daily Press, than they should. The plain fact is that since the railways were nationalised in 1948 they have had a working surplus in some years and a loss—not more than a very small percentage of the turnover—in others, but not one penny to meet losses has come from the pockets of the taxpayer. The only way in which the taxpayer could be affected would be if the British Transport Commission failed to meet the interest on its stock, for, unlike a normal commercial undertaking, it cannot reduce its dividends or not pay a dividend at all in a bad year. The interest must be paid in full each year, which it has been, the deficits having been met from its own resources. The issue of British Transport stock in exchange for that of the former companies on nationalisation corresponded to the normal commercial procedure when one company takes over another—with the difference that interest on the new stock was assured and insulated from the dividend variations of commercial practice. The guarantee that the interest will be met by the Treasury should the Commission default has never been called on, and there is no reason, with the progress being made in modernising British Railways, why it ever should be necessary.

In two articles in the *News Chronicle* recently, Mr. Alan Wood has suggested that the management of British Railways is not applying proper commercial principles to the conduct of its business. On April 17 he wrote . . . "On the other hand you have British Railways, with no incentive to increase traffic at all, because any losses are borne by the taxpayer" and suggests that in the competition between road hauliers and "a nationalised industry sublimely indifferent to its losses" the road services were bound to win. As Mr. J. H. Brebner, Public Relations Adviser to the Commission, pointed out in a reply—published in a much-shortened form—the Commission has every possible incentive to increase traffic: financial, because it can only spend what it earns; moral, because the success or failure of the enterprise is subjected to close public scrutiny from year to year; and personal, because every railwayman "has been brought up in the tradition that his future depends on traffic being secured." Such deficits as have been incurred, though large considered in isolation, are very small when examined in relation to turnover. The margin of deficit is, in fact, only 1½ per cent, and has, as already stated, been met from the Commission cash resources.

When Mr. Wood claims, as he does in the *News Chronicle* of April 24, that "deficits are not met by straightforward Government subsidy, but by 'loans' or similar devices" and suggests that the taxpayer still has to find the money, he is distorting the facts. The loans are in truth loans, which must be repaid with interest in due course. Neither are they in any sense subsidies, but are required to tide over the Commission until the modernisation and re-equipment of the railways begins to bear fruit. If money is borrowed on the market for a large engineering project there is nothing unusual in interest being paid from the loan itself until the project is finished and begins to earn money. The principle is exactly the same in regard to railway modernisation and the current Government loans. There is no ground whatsoever for the constant suggestions that British Railways are indifferent to success or failure and rely on the taxpayer to keep them going in time of difficulty.

The North Eastern Railway of India

IN many respects the North Eastern Railway may be regarded as the least favoured by natural and economic geography of the seven railways in the Republic of India. Its 4,787 route-miles combine to form the only system in the country that is virtually all-metre-gauge, though there are 70 miles of narrow gauge; it also suffers from its heterogeneous composition. Throughout the 800-mile tract of country it serves, it runs mainly parallel to and at varying distances from the Himalayan foothills, from which debouch many great and small rivers and streams. The crossing of so many of these drainages is a veritable menace from the civil engineer's point of view, as was only too apparent during the last war, when the main line of communication for the Burma campaign, a metre-gauge line of the then Eastern Bengal Railway, was breached by washouts. The North Eastern is, moreover, made up of many railways, sections of railways, and connecting links, each with its own standard of equipment and maintenance, the majority being of branch-line standard. The regions it serves, notably large tracts of the States of Uttar Pradesh, Bihar, and West Bengal on the left bank of the Ganges, and the State of Assam, are of great economic importance.

Isolated from most of the greatest cities and industrial areas in the Republic, the North Eastern administration has to depend largely on wagon ferries and passenger steamer services across the Ganges and Brahmaputra. Since Partition, in 1947, the lines in Assam have been connected with the other lines of the N.E.R. and, consequently, with the rest of the railways in the Republic of India by the remarkable, if hastily-constructed, Assam Link line, which because of its immediate proximity to the mountains continues to be an anxiety and costly item in formation and bridging maintenance. The drastic limitation of time allowed for preliminary examination and construction of any line in such vulnerable terrain would make these subsequent handicaps inevitable.

In the circumstances, the allocation of £45,000,000 for this whole 4,787-mile system under the First Five-Year Plan seems less than liberal, but amends are made in the Second Plan by an allotment of £91,500,000. This should enable an adequate start to be made in the consolidation of this conglomeration of lines, their rehabilitation, and the provision of adequate operating and maintenance facilities. At present overcrowding of passenger trains and inadequate facilities for the movement of goods are paramount considerations. In the Second Plan period, passenger trains are being lengthened and extra trains are being run to provide over 10 per cent additional passenger train-miles and 29 per cent more passenger vehicle-miles; provision is also being made to cope with a 25 per cent increase in general goods traffic.

With these ends in view the locomotive stock is to be increased from 930 when the railway was formed, to 1,330—of considerably greater individual capacity—by 1961. Similarly, coaches will be increased from 4,340 to 6,500 and wagons from 19,750 to 40,000. To keep this increased stock in repair the existing workshops at Gorakhpur and Izatnagar were expanded during the First Plan period and new carriage and wagon shops near Pandu, in Assam, on the far side, or left bank, of the Brahmaputra wagon ferry, are provided for in the Second Plan at a cost of £6,000,000. These shops will in part replace the Saidpur shops, which were lost to the Eastern Bengal Railway of Pakistan at Partition. Running-repair facilities are also to be materially increased by the construction of a number of new locomotive sheds and carriage and wagon depots and the modernisation of existing ones.

Meanwhile, among the enhanced facilities for traffic operation, 163 miles of line are to be doubled, 65 additional crossing stations are to be built, additions or extensions of crossing loops are to be provided at 144 stations, and 17 station yards are to be remodelled. In addition, a new transhipment yard is being constructed at Barauni to cater for the heavy goods traffic expected to cross the new Ganges Bridge near Mokameh; it will be able to handle 1,250 wagons daily. Moreover, the first (37-mile) section

of centralised traffic control in India is to be installed on the N.E.R., and signalling and interlocking, at present below Indian general standards, are to be extensively improved; 70 main-line and nine branch-line stations are to be interlocked under the Second Plan.

On the civil engineering side, methods of maintenance previously differing on the various components of this railway are being unified and modernised. A committee has been appointed to recommend methods for stabilising the more vulnerable sections of the Assam Link. In recent years traffic has been interrupted for considerable periods by breaches and floods. To eliminate one of the worst sections and insure continuity of traffic flow, an alternative alignment is already being surveyed. Some 1,000 miles of track are to be renewed and rerailing is to be carried out on 860 miles. Many bridges are to be strengthened; the largest bridgework being undertaken is the Gandak Bridge near Sonepore at a cost of £1,500,000. Technical training facilities are being increased, and 15 hospitals, nine child-welfare centres, seven institutes, four high and 40 primary schools, and four hotels are to be built by the railway. Also, 11,000 new staff quarters are proposed, and staff colonies at 30 stations are to be equipped with water supplies. A new and partly air-conditioned three-storey headquarters office building is to be built at Gorakhpur at a cost of about £350,000.

Western Region Summer Timetables

IN the summer timetables of the Western Region, operative from June 17, the principal development is the new express service, to be maintained with diesel units provided with refreshment accommodation, between Birmingham and South Wales. Westbound there will be four trains daily, at 8.25 a.m. and 5.5 p.m. from Birmingham Snow Hill to Swansea, and at 12.25 and 8.30 p.m. from Birmingham to Cardiff. The 8.25 a.m. will be non-stop to Gloucester in 83 min., and thereafter will call only at Newport, Cardiff and Port Talbot, reaching Swansea at 12.5 p.m.; the 5.5 p.m. will call in addition at Cheltenham (Malvern Road), Bridgend and Neath, arriving at 9 p.m.; the 8.30 p.m. at Stratford-on-Avon, Cheltenham, Gloucester and Newport; and the 12.25 p.m. at the same stations and at Lydney, Chepstow and Severn Tunnel Junction. The 2½-hr. timing of the 8.25 a.m. and 8.30 p.m. from Birmingham to Cardiff is the fastest on record, 15 min. less than the quickest existing train.

In the reverse direction the 8.5 a.m. and 4.15 p.m. from Swansea will be the fastest services, both calling only at Port Talbot, Cardiff, Newport, and Gloucester, and taking 2 hr. 50 min. and 2 hr. 47 min. respectively; there will also be the 12.10 and 8.15 p.m. from Cardiff to Birmingham, arriving at 2.50 and 11 p.m. The new service will double the existing service, which is of two through trains only in each direction. For the first time also there will be a through Sunday service by this route, at 9 a.m. and 6.5 p.m. from Birmingham to Swansea, calling at all principal stations and reaching Swansea at 1 p.m. and 10.5 p.m., and at 9 a.m. and 5.5 p.m. from Swansea, reaching Birmingham at 1.5 and 9.5 p.m.

On the main line from Paddington to Birmingham and the North via Bicester, completion of the reconstruction work on Souldern Viaduct will permit some acceleration of the principal trains, though with Banbury station reconstruction work still proceeding, the fastest schedules since the war will not as yet be restored. In most cases the running times will be cut by 5 min., the 10.10 a.m. "Cambrian Coast Express" thus reaching Birmingham in 2 hr. 3 min., but the 9 a.m. down "Inter-City" will be accelerated 8 min. to reach Birmingham in 2 hr. 7 min. In the up direction the 9 a.m. from Birmingham will be speeded up by 10 min., to arrive at 11.10 a.m., the 5 p.m. by 9 min. to a 2¼-hr. run, the 8 a.m., 6 and 8 p.m. by 7 min., and the remainder by 5 min. each.

The "South Wales Pullman" is to leave Paddington at 8.50 a.m., as a relief to the 8.55 down, instead of 9.55 a.m., and there will be no departure at the latter hour except on Saturdays. It will call additionally at Bridgend and Neath in both directions, taking 4 hr. 20 min. to Swansea (15 min. deceleration), and on the up run, leaving Swansea 5 min. earlier, at 4.30 p.m., it will reach Paddington at 8.45 as before.

On the West of England main line the 12.35 a.m. from Paddington to Penzance, which in previous summers has run on Saturday mornings only, will run daily, starting at 12.30 a.m.; it will be composed of sleeping cars only and stop first at Plymouth at 5 a.m., and thereafter at all principal stations in Cornwall, reaching Penzance at 8.5 a.m. Sleeping cars will be run also on the 9.50 p.m. from Paddington to Penzance and the 11.50 p.m. to Plymouth as hitherto. Last summer's arrangement of confining travel by the "Cornish Riviera Express" and the "Torbay Express" to registered seat passengers only is not repeated this year. There are no other Western Region changes of note.

As we have suggested previously concerning railway timetables, an opportunity for some valuable publicity seems to be missed by not indicating specially the train services which are worked by diesel units or by electric trains, as is almost invariably the practice abroad; this applies in particular to the new Birmingham-South Wales service. Another innovation which would be of no small value to the public would be to devote a page or two of the timetable to a summary of the most important train service changes that have been made in the new timetable, particularly new trains, accelerations, and altered starting times.

Letter to the Editor

(*The Editor is not responsible for opinions of correspondents*)

The Rise of Diesel Motive Power

April 23

SIR,—Your April 19 issue told us that the British Transport Commission was sending a party of railway officers to study American operating methods, including the use of diesel motive power. Our people will not see many steam locomotives, for on March 1, the Class 1 railways owned only 3,437. These remnants of a steam fleet, which numbered 40,040 in 1940, are being replaced by diesel units at the rate of nearly 100 a month. On March 1, diesel ownership amounted to 26,453 units and 870 more units were on order. The railways are now equipped to work 65 per cent more revenue ton-miles than they produced in 1940, though their stock of locomotive units of all types has been reduced since that year by 11,220 units, or by 27 per cent. This revolution in traffic working enabled the railways to keep their operating ratio below 80 per cent during recent years of mounting costs, while they made continuous progress in efficiency of service.

It is to be hoped that none of your readers will be misled about the present position on the U.S.A. railways by Mr. L. Irvine-Brown's letter in your April 12 issue, asserting that "with everything being spent on motive power, there has been insufficient left to buy freight cars, of which there are no longer enough to cope with the traffic offering." Actually there has been an average daily surplus of some thousands of wagons in the first quarter of this year. On March 1, the railways had 22,645 more wagons available than a year ago, but during 12 weeks to March 23, wagon loadings were 322,690 less than in 1956, a decrease of nearly 4 per cent.

Something is amiss with the American industrial economy at present, as output of coal, steel, and manufactured goods is sagging considerably. As soon as production improves, the railways have ample facilities to turn out more ton-miles. On March 1, they had orders outstanding for over 100,000 new wagons, so that wagon supply should be adequate throughout 1957.

Yours faithfully,

R. BELL

Frognal, N.W.3

THE SCRAP HEAP

Non-Paying Passenger

When an Inner Circle train arrived at Aldgate Underground station recently, the station staff discovered a grey tabby cat with a black nose, wearing a blue leather brass-studded collar, asleep on a seat. She was awakened, removed to a staff room and given food and drink. Then they summoned the P.D.S.A., who took her to the sanatorium to await an owner.—*From "The Animals' Magazine."*

No Party Politics

Replying to Mr. Trevelyan, in the House of Commons, Mr. Lloyd George said he had received a letter from the London & South Western Railway Company admitting that in July, 1906, they contributed £100 to the funds of the London Municipal Society. "They were not aware that it was in any way connected with party politics," continued the President of the Board of Trade. "They thought it was entirely a society to assist in reducing the rates." (Laughter).—*From "The Evening News, April,* 1907.

Foiling the Train-Wreckers

A correspondent in Ireland states that during the agrarian disturbances in that country in the middle decades of the last century, saboteurs used to attack trains carrying military and police; the common practice was to place stones on the line. The engines hauling such trains were therefore fitted with a special apparatus invented by one Curtis, about 1839; this had been devised to remove fallen boulders or rock on the rails and also to act as a brake. It consisted of a heavy cast steel shoe (G in the contemporary drawing reproduced below) over each rail, worked up and down by two swing levers C and D, the latter actuated by the lever A. Acting like a cowcatcher, the device ploughed the impediment off the rails, and the driver used it also as an additional brake to stop the train so that the soldiers and police could dismount and search the neighbourhood.

Alias

The station shown in the current London Midland Region timetable as Corby & Weldon, on the Kettering to Nottingham line of the L.M.R. Midland Division, has been renamed Corby, *tout court.* The Midland Railway opened its alternative route from London to Nottingham via Corby and Melton Mowbray on June 1, 1880. According to the London Midland Region edition of the April issue of *British Railways Magazine,* what is now Corby Station was opened in 1880 to serve a local population of about 1,000, and now serves a new town of 26,000, and has undergone four changes of name. It has been known as Corby & Cottingham, Weldon & Corby, Corby & Weldon, and is now just plain Corby.

Ornate Signals

An ornate type of angle bracket, shown in the accompanying illustration, was produced by the Midland Railway for signals at Nottingham when the Midland station was enlarged in 1902. The Midland were experiencing competition from the fine new station, Nottingham Victoria, opened jointly by the Great Central and Great Northern Railways and went to some lengths to make the Midland station attractive, even to the signals, by introducing into the angle bracket the wyvern which figured in the crest and coat of arms of the Midland Railway Company. The wyvern was also used on letter paper and on posters, enginemen's and signalmen's caps. All these angle brackets have now been withdrawn.

Signal angle bracket of 1902 *incorporating the Midland Railway Company wyvern*

Cat's Prerogative

A mouse jumped from the folds of a red carpet being unrolled at the railway station in preparation for the visit of King Frederick and Queen Ingrid of Denmark to Aalborg, Jutland.

Spring Fret

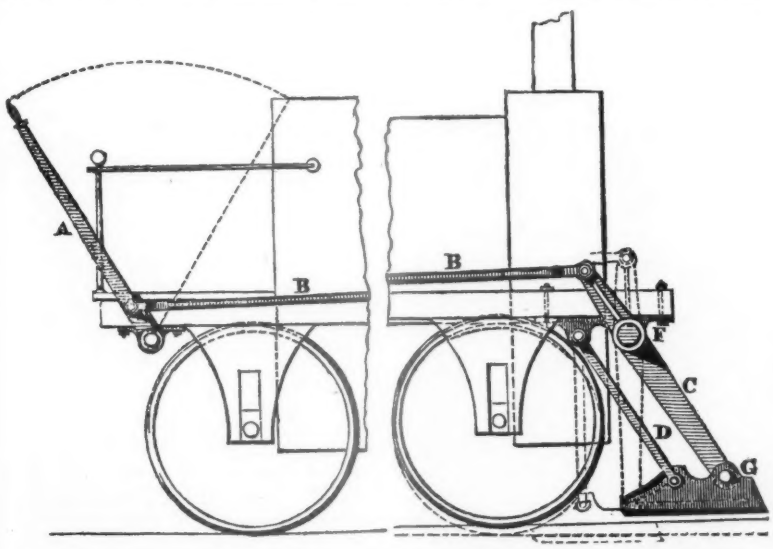
There's a coach that's coyly hiding
In some far, secluded siding,
Where the springtime sunshine sheds its fitful gleams;
Painted, maybe, green and gold,
Red, or brown, and rather old,
It will take me, one day, to my land of dreams.

When I'm on the way once more
To some far, enchanting shore,
I shan't hanker overmuch for Pullman ease;
Let who will protest or frown,
I shall let the window down
And drink in the heady, summer-scented breeze.

I shall love to glide along,
Listening to the siren song,
Lulled to slumber by its rhythmical refrain,
As each spurning, speeding wheel
Adds its antiphon of steel
To the old familiar music of the train.

But Time's chariot hastens on
And so much of life has gone,
With the joys that only memory can reclaim;
Maybe I shall go no more
To that far, enchanting shore,
But it's nice to dream about it, all the same.

A. B.



Contemporary drawing of the device reported to have been employed in Ireland in the 1840*s to remove obstacles placed on track and to act as an emergency brake*

OVERSEAS RAILWAY AFFAIRS

(From our correspondents)

INDIA

New Through Service in Andhra

With the formation of the State of Andhra with its capital at Hyderabad, a through passenger train service has been introduced between Hyderabad, Central Railway, and Vizagapatam, South Eastern Railway, over the Southern Railway between Bezwada and Waltair. The new train leaves Hyderabad at 4.10 p.m. and arrives at Vizagapatam at 7.45 p.m. the following day. The return train from Vizagapatam leaves at 8.30 a.m. and arrives at Hyderabad at 10 a.m. next day.

PAKISTAN

Quetta-Zahidan Section Breached

The section from (Quetta) Spezand Junction westwards to Zahidan, 440 miles, was breached some weeks ago in several places, but normal train service has since been restored. The terminus at Zahidan is on the Persian frontier.

EAST AFRICA

Breakaway of Freight Train

The main line between Muguga and Limuru on the Nairobi-Nakuru section was blocked early on April 1, when a freight train from Nairobi to Nakuru parted between Limuru and Uplands stations. The driver, observing regulations, took the first five wagons forward to Uplands and returned to pick up the remaining 40. Whilst efforts were being made to couple up with these they broke away and ran through Limuru station and tunnel. Ten full oil tanker bogies capsized and piled up in a 60-ft. cutting, whilst, further down the same cutting, three other wagons also capsized and at the same time acted as an anchor for the rest, which came to a halt on the line. The gross ton load of the train was 1,027. Normal services were resumed within 54 hr.

The accompanying illustration shows the 60-ft. cutting where the 10 oil tank wagons capsized, also the nature of the soil through which the cutting was excavated.

Locomotive Christened at Kisumu

The *Luo* " 29 " class locomotive, No. 2918, built by the North British Locomotive Co. Ltd., was officially christened by Chief Elijah Bonyo at Kisumu on April 11. This is the eighth " Tribal " class locomoive to be named at an official function by a senior representative of the tribes concerned. A further naming ceremony took place at Soroti on April 26, when the Chairman of the Teso District Council christened the *Iteso* locomotive. There are 103 locomotives within the " Tribal " class and a further three ceremonies are envisaged, all other name plates being affixed to the locomotives in the mechanical workshops, one in Uganda and two in Tanganyika.

NIGERIA

Maiduguri Extension

The final route for the railway extension to Maiduguri has been selected, according to the " First Progress Report on the Economic Programme 1955-60 " just released by the Federal Government.

The report states that the line runs from a point near Kuru, on the Plateau, to Bauchi, Gombe, and Maiduguri. It has been photographed from the air and the ground control survey party has completed its work from Kuru to a point east of Gombe. On the basis of the map so produced the engineers have so far staked out the centre line for some 30 miles. Work will continue throughout 1957.

RHODESIA

Leyland Vehicles for Rhodesia Railways

Delivery is being made of over 30 eight-wheel, 24-ton diesel Octopus trucks, built in Lancashire by Leyland Motors Limited. Similar Leyland models are already in use by Rhodesia Railways, in conjunction with six-wheel trailers, for hauling cattle from ranching areas to cold stores in the towns. Among other jobs carried out by the Octopus fleet is the haulage of bagged sugar on a 120-mile run, partly over dirt track and partly over strip roads.

CANADA

C.P.R. Hotels for Sale

Three well-known Canadian Pacific hotel properties in Nova Scotia are to be offered for sale because they no longer fulfil the purpose for which they were built. The Cornwallis Inn at Kentville, the Digby Pines at Digby, and the Lakeside Inn at Yarmouth were built, as were other Canadian Pacific hotels and lodges in the Rockies and elsewhere in Canada, at a time when holidaymakers generally used the railway as a means of transport, and as such they were designed to feed traffic to the railway. Now, however, most holiday visitors to Nova Scotia travel by motorcar.

After the breakaway between Limuru and Uplands, East African Railways

BRAZIL

Rail Service for New Capital

The Central Railway is being extended from Pirapora to Brasilia, on the plateau of Goias, where a new Federal capital city is being built. The transfer of the Federal Administration is due to take place in 1960. A line is to be built connecting the new capital to a convenient point on the Goias Railway and thence to the Santos-Jundiahy system; another is to be built to link Brasilia to Goiania, on the Goias Railway.

UNITED STATES

Further Increase in Diesel Fuel Costs

At the end of January American railways were notified by the oil producers of a rise in the price of diesel fuel oil, ranging from ¼ to 1 cent. per gal. Between 1949 and 1956 the price has risen by 17·5 per cent, while the con-

sumption by American railways in train operation had increased from 34,106,000 barrels in 1949 to 81,285,000 barrels by 1955, and has since seen a considerable further increase. One large supplier reports that the price is now 11·3 cents a gal. for high grade diesel fuel (50 octane), and 10·75 cents for the most popular economy grade (40 octane). This latest increase will add roughly $1,500,000 to the annual operating expenses of the New York Central System, and a smaller line like the Delaware, Lackawanna & Western will pay $400,000 more a year.

SWITZERLAND

Basle to Belinzona Non-Stop

The summer timetable includes a new non-stop run from Basle to Belinzona by the "Riviera Express," a new train from Cologne to Ventimiglia, which will cross Switzerland at night and run via Olten, Aarau, and Wohlen without calling at Lucerne.

FRANCE

Mobile Welding Units

In connection with the use of arc welding for the building up of rail joints, the S.N.C.F. has designed, in conjunction with specialised firms, light mobile generator sets for use on the permanent way. The complete unit weighs between 10½ and 11½ cwt. and has a width of 2 ft. 3½ in. to 2 ft. 5½ in. The units can be moved either along the cess at the side of the permanent way or, by means of a light trolley, along the track itself. In the latter case, with the aid of a derailing platform, three men are able to remove the unit from the rails.

The generator sets are equipped with air-cooled petrol engines developing 20 h.p. at 3,000 r.p.m., and at the present time the S.N.C.F. has 16 d.c. units and 10 a.c. units in operation.

WESTERN GERMANY

Radio-Controlled Hump Locomotive

An electric locomotive fitted with radio control has been working for some time experimentally in the marshalling yard at Munich East. The locomotive, of type E. 91, is used for pushing freight trains up the hump for sorting. The trial was undertaken jointly by the Siemens-Schuckert-Werke and Siemens & Halske companies, which built and installed the radio equipment, working in collaboration with the Munich Divisional office of the German Federal Railway.

The remote control is on the impulse-step principle. The impulses are sent by an ultra-short-wave transmitter, installed at the control point on the hump, to the locomotive. There are 13 possible commands which can be sent to the locomotive from the control point and four indications can be returned from the locomotive to the control point. The fact that the apparatus is in proper working order is indicated by a pilot note. If this ceases, the locomotive at once comes to stand.

From his control desk, the humpmaster can operate the locomotive without need for a driver and set the train forwards or backwards as required. There are five forward power notches, four braking notches, and one for the standing position.

In hump service the tractive effort can be adjusted throughout the full low-speed range in the flexible and delicate manner which such operations demand. Because of the rapid response of the equipment to the controls, remote control is considered to have particular advantages in this field, enabling the speed of the wagons passing over the hump to be adjusted rapidly to circumstances and thereby improving hump performance. The locomotive, if required, can be manned by a driver who can take control in an emergency.

EASTERN GERMANY

Warnemünde-Gedser Ferry Service

The service between Berlin Ostbahnhof and Warnemünde, en route to and from Gedser and Copenhagen, is operated by the State Railway (Reichsbahn) of the German Democratic Republic (Eastern Germany) and not by the Federal Railway (Bundesbahn) of the German Federal Republic (Western Germany) as might be inferred from the statement on page 417 of our April 12 issue.

Publications Received

The Railwaymen's Year Book. 1957. Hampton Court, Surrey: Railway Publications Limited, Craven House. 8½ in. × 5½ in. 96 pp. Price 5s.—This edition is the first to appear under new ownership. Although it retains many familiar features, the scope has been broadened and new items have been added. Special articles outline the progress of the modernisation plan for British Railways and the effect of the plan on signalling methods. There are also articles on gas turbine traction in Britain and railway speed in 1956. The tables of information, particularly on locomotives, are compact and useful and add to the value of the year book, which, as a whole, is an improvement on previous editions.

Benguela Railway Trans-African Connections.—An attractive folder issued by the Benguela Railway Company, the address of whose London Committee is Princes House, 95, Gresham Street, E.C.2, contains two excellent maps: one of the continent of Africa, showing the Benguela Railway and its connections with other African railways, with the possibilities of through consignments and travel via Lobito Bay; and the other a more detailed map in colour of Angola and the adjacent territories, indicating the Benguela and other systems. The cover bears a coloured representation of a Beyer-Garratt locomotive hauling a freight train. The folder gives some useful particulars, including a list of agents. A description of new Beyer-Garratt engines for the Benguela Railway appeared in our January 4 issue; and editorial comment on the line was made in the same issue and in that of February 1; further reference is made on another page this week.

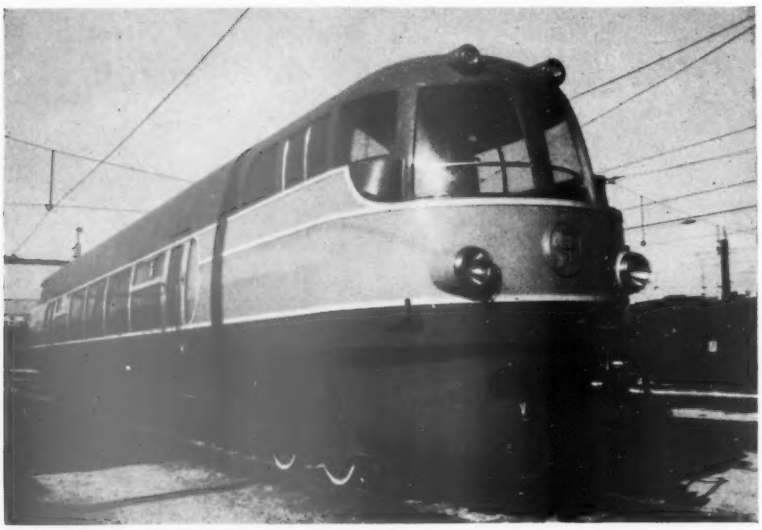
Handbook of Stations, 1956. London: British Transport Commission (Railway Clearing House), 203, Eversholt Street, N.W.1. 13¼ in. × 8 in. 494 pp. Price 25s.—The publication of a new edition of this official guide has been long awaited. It is almost 20 years since the last edition appeared and there have been many changes in the traffic-handling capabilities of railway stations in Great Britain and Ireland since then. It is in the information given on these matters that the greatest usefulness of the book lies, but it also enables any station or siding to be located easily and quickly. Editorial reference appears on another page.

Welding of Steel Pipelines and Assemblies.—Revised British Standard B.S. 1821-1957, for Class 1 oxy-acetylene welding of steel pipelines and pipe assemblies for carrying fluids, takes into account the proposals contained in B.S. 2633. The present revision specifies requirements for shop and site welding, being suitable for Class 1 conditions, and available in sizes up to 24 in. dia. It deals with all types of butt welds, and branch and sleeve welds. Qualifying tests are dealt with in three sections, and include testing of specimen welds for procedure and welder qualifications. Copies can be obtained from British Standards Institution, 2, Park Street, London, W.1. Price 10s.

All-In Holidays in Ireland.—Inexpensive, eight-day, holidays in Ireland are offered this summer by the C.T.A.C. (Creative Tourist Agents' Conference) in conjunction with British Railways. This extension of the C.T.A.C. inclusive holidays in Scotland and the Isle of Man, will serve over 20 main starting points in England and Wales. It is possible to travel, for example, from Birmingham or Newcastle via Holyhead, or from Cardiff or Plymouth via Fishguard with reserved seat on the train and with guaranteed first class berth on the steamer, and at an all-in price enjoy a week's holiday in Killarney or Dublin. Hotel accommodation is provided and sightseeing excursions are included. Details are given in the C.T.A.C. folder "All-In Holidays in Ireland" available from travel agents.

Experimental Coach with Pendulum Suspension

Attempt by S.N.C.F. to obtain higher speeds on curves without discomfort to passengers or excessive stresses on track



French National Railways coach with pendulum suspension, showing rounded sides to give clearance at high speeds

THERE has recently been completed in the Sotteville works, at Rouen, of the French National Railways, to which we are indebted for the accompanying photograph and relevant information, a prototype experimental vehicle with which, by making use of the principle of pendulum suspension, an endeavour is being made to improve the stability of rolling stock and enable it to traverse curves at speed with the maximum of comfort for the passenger. Tests are to be undertaken with the new coach from which it is expected to obtain valuable information on which to base further and more comprehensive investigations into this problem.

Principles Involved

The centrifugal effect produced when a railway vehicle passes round a curve can theoretically be compensated by providing an equivalent amount ot superelevation, but in practice there are limits to what can be done in this respect, as it reacts disadvantageously in the case of slow moving trains by increasing the load acting against the lower rail, while trains may of course have to stop on the curve, when this is felt even more.

Superelevations

On the French National Railways superelevations up to 150 mm. (nearly 6 in.) are admitted, giving a maximum lateral uncompensated acceleration value of 0.10 *g*. On the Paris-Lyons line, for example, where speeds of 140 km.p.h. (nearly 87 m.p.h.) are permitted on curves of 950 m. (1,039 yd.) radius, with superelevation of 140 mm. (5½ in.) this value for *g* amounts to 0.07. The passenger has to react against the effect so produced and experiments have shown that anything over 0.10 *g* was definitely unpleasant.

If it is desired to run at higher speeds than this on curves of only 800 m. (875 yd.) radius while keeping superelevation to not more than 140 mm. (5½ in.), which will be necessary under the contemplated programme of timing runs between Paris and Lyons at as much as 160 km.p.h. (nearly 99½ m.p.h.) and even 180 km.p.h. (nearly 112 m.p.h.) without slackening for curves, it is imperative to do something to reduce or eliminate any disagreeable consequences for passengers that otherwise must result.

A very similar problem will be encountered directly an attempt is made to raise the level of speed appreciably on cross-country routes on which sharp curves are numerous.

Results of Trials

One way of doing this is to make the vehicle body swing pendulum fashion around a longitudinal axis situated above the centre of gravity and trials were undertaken accordingly in February, 1947, between Paris and Etampes at speeds up to 160 km.p.h. (nearly 99½ m.p.h.) on 800 m. (875 yd.) radius curves with a swinging compartment located in the interior of an ordinary coach body.

These trials runs showed that the lateral acceleration of the compartment was markedly reduced, its value for *g* being 0.06, while that of the main part of the vehicle reached 0.24, or four times as great, with extremely unpleasant effects. The compartment was found to take up exactly a position resulting from the combined action of gravity and centrifugal force.

Encouraged by these experiments the S.N.C.F. management decided to construct a complete new vehicle embodying the principle involved. Such an attempt had been made five years before in America but the desired result was obtained by varying the action of the spring suspension components and not by applying a true pendulum suspension in the sense here mentioned.

The objective now aimed at was to enable appreciably higher speeds to be attained without discomfort for the passenger, or excessive lateral dynamic effects on the track. To assist in meeting the latter requirements the four bogie wheels were made independent, eliminating hunting, and the additional wear likely to be created by this was counteracted by reducing the weight of the bogie itself.

Simulating Conditions in Motor Coach

In pursuance of this idea it was intended originally to build a motor coach and dispense with locomotive haulage, which itself subjects the track to considerable lateral thrust, but finally the vehicle was constructed as a trailer, with equivalent weights placed in appropriate positions to simulate the conditions given by a motor coach.

Greater speed necessitates improved braking and disc type equipment was therefore installed, as allowing readier dissipation of heat, rendered less than it otherwise would be at 200 km.p.h. (124¼ m.p.h.) by the low wheel load of 4·5 *tonnes*.

Experimental Coach

The body of the new vehicle has a drop girder underframe with swan neck formation at each end, resting in turn on supports which project from the bogies.

The vehicle has accommodation for 32 passengers and the leading dimensions of the whole are:—

Length between bogies..	16·86 m. (55 ft. 1 in. approx.)
Length of body	22·57 m. (72 ft. 9 in. approx.)
Length overall	22·90 m. (73 ft. 1 in. approx.)

The body can incline to 18 deg. on each side of the vertical and its rounded sides enable it to do so without encroaching on the prescribed clearance limits. The horizontal axis of oscillation is 1·75 m. (about 5 ft. 9 in.) above rail level with the centre of gravity arranged to fall 70 cm. (2 ft. 3⅝ in.) lower. As a large proportion of the total weight of the vehicle of 37 *tonnes* is accounted for by the mechanism, the body proper has been built of argon process welded light-alloy construction.

Abandonment of Steam Power in the U.S.A.—1

Changeover from steam to electric and diesel-electric power

By A. G. Hoppe

Former Mechanical Engineer, Chicago, Milwaukee, St. Paul & Pacific Railroad

TO obtain an understanding of the revolution in motive power on U.S.A. railways, we should look briefly at events following the first world war, as it was in this period the foundation was laid for a complete change of motive power in less than 20 years; the figures in Table I show the rate of change, and distribution from 1921 to October, 1956. The steam locomotive was unchallenged on the larger railways until shortly after the turn of the century, when appreciable mileages of main-line railways were electrified. By the end of 1917 there were 16 electrification schemes on 15 railways; a total of about 2,365 track miles. These changes in operation were intended to overcome specific conditions, such as tunnels, dense suburban traffic, or serious mountain grades. By the end of 1925 the track miles had increased to nearly 3,600.

TABLE I—NUMBER OF STEAM, ELECTRIC AND DIESEL-ELECTRIC LOCOMOTIVES, CLASS I RAILWAYS

Year*	Steam	Electric	Gas-turbine Electric	Diesel-Electric
1921	64,585	364	—	—
1922	64,140	372	—	—
1923	64,939	379	—	—
1924	65,006	352	—	—
1925	63,612	362	—	1
1926	62,342	419	—	10
1927	60,895	449‡	—	14
1928	58,845	596	—	21
1929	56,936	607	—	22
1930	55,875	618	—	74
1931	54,385	670	—	77
1932	52,492	725	—	77
1933	50,064	738	—	79
1934	47,436	748	—	97
1935	45,614	842	—	113
1936	44,162	817	—	143
1937	43,624	818	—	218
1938	42,637	829	—	314
1939	41,117	843	—	510
1940	40,041	858	—	797
1941	39,624	857	—	1,267
1942	39,491	855	—	1,667
1943	39,725	868	—	2,125
1944	39,681	863	—	3,049
1945	38,853	842	—	3,816
1946	37,551	832	—	4,441
1947	35,108	821	—	5,772
1948	32,914	829	—	8,089
1948	28,964	817	—	10,888
1950	25,640	788	—	14,047
1951	21,747	780	—	17,493
1952	16,078	756	6	20,492
1953	11,787	699	10	22,503
1954	8,650†	656	25	23,531
1955	5,982†	627	25	24,786
1956 Oct. 1	4,251†	601	25	25,923

* As of December 31.
† One steam turbine-electric locomotive not included.
‡ Reports for 1926 and previous years showed number of locomotives which included some multiple-unit arrangements. Subsequent reports showed number of units, a unit being defined as any independent wheelbase not necessarily capable of independent operation

The performance of electric locomotives on these early electrifications, compared to that of existing steam locomotives, caused the supporters of electric operation to predict the early passing of the steam locomotive, with the electric locomotives taking over on all important railways. The defenders of the steam locomotive pointed out that the comparisons were based on the performance of modern electric locomotives, and that of obsolete, saturated steam locomotives. Furthermore, electrification as a general substitute for steam operation was far too expensive to justify the large investment needed for power plants, overhead construction, bonding of rails, and also the high cost of electric locomotives compared with that of modern steam power. For the special conditions previously outlined it was conceded that electrification could probably be justified.

The proponents of the steam locomotive were the better prophets, for while there was some increase in electrified track, at no time did it reach even two per cent of the total track operated by class I railways. Thus passed the first threat to the supremacy of the steam locomotive, and it was not a serious one. It did, however, have the effect of spurring the designers of the steam locomotives to new and greater efforts to improve this type of motive power.

Beginning of Diesel-Electric Traction

The principle objection to electrification for general application was the first cost of the installation and the initial cost of motive power. The entire dependence of the electric locomotive on trolley or third rail, compared with the complete freedom of movement of the steam locomotive, and the possibility of power failure tying up a considerable area were further shortcomings. The use of an internal combustion engine was soon suggested, with the type of transmission not too clearly outlined. One of the earliest suggestions for combining the diesel engine with electric drive, proposed the use of a 1,800-kW. electric-generating plant on a railway car, attached to, and furnishing power for an electric locomotive.

This arrangement could be operated on existing right-of-way, and would retain the flexibility of movement of the steam locomotive, increase overall thermal efficiency, and would eliminate the smoke, and so on, associated with the steam locomotive. While this suggestion was never carried out, it brought about serious consideration of the diesel engine as a prime mover for railways.

About this time some of the larger cities in the U.S.A. were taking steps to eliminate the smoke and steam of steam locomotives. New York City, where the electrification of the two passenger terminals had eliminated the use of the main-line steam locomotive, left the shunting engine still in service. The State of New York passed a law on June 22, 1923, requiring that all railways discontinue the use of steam locomotives within the limits of the City of New York by June 1, 1926. It was contemplated that this would be accomplished largely by electrification. While certain of the track could undoubtedly be electrified, other tracks, virtually on city streets, were not so easily susceptible to this solution.

Diesel-Electric Shunters

In 1924, a combination of the American Locomotive Company, the General Electric Company, and the Ingersoll-Rand Company (the last-named being a builder of diesel engines) offered a small shunting engine, powered by a 300-h.p. diesel engine with electric drive. This locomotive was delivered to the New York Central Railroad on June 10, 1924, to be tried out in the shunting area along the docks on West Street, this being one of the locations where electrification was deemed impracticable; this was, as far as is known, the first diesel-electric locomotive operated on a principal railway of America.

By July 9, 1925, this locomotive had been loaned to 14 other railways for test purposes. The tests on Manhattan Island were apparently successful, since the New York Central purchased additional locomotives of the same type, modified by the addition of trolley and third-rail equipment for operation on the existing electrified line, and the further addition of a storage battery of sufficient capacity to operate the traction motors for short periods. It remained, however, for the Central Railroad of New Jersey to claim the purchase of the first diesel-electric shunting locomotive for service on its property. This locomotive was delivered on or about October 22, 1925. This was followed by delivery of the same type to the Baltimore & Ohio; the Erie; and the Chicago & North-Western railways, between October, 1925, and May, 1926.

Parallel with this development, the Baldwin Locomotive Works built a 1,000-h.p. diesel-electric shunting engine, which was completed in June of 1925. The Baldwin Company were primarily builders of steam locomotives, and Mr. Samuel Vauclain, then President of the Baldwin Locomotive Works, indicated that the locomotive was not for sale, and expressed the opinion that considerable time must elapse, and much expenditure incurred in development of an oil-electric locomotive before such machines would figure to any great extent in railway transportation.

During the next decade, the combination of the American Locomotive Company, General Electric Company, and Ingersoll-Rand Company, built a

number of locomotives of the same type, and some of greater horse-power for delivery to various railways, principally for shunting service. Other builders, the Westinghouse Electric & Manufacturing Company with Baldwin Locomotive Works, the Brill Company, the American Locomotive, and General Electric Companies, independently of Ingersoll-Rand, delivered a number of locomotives to several railways. Progress was slow, and by the end of 1935, class I Railways reported ownership of 113 diesel-electric locomotives of all kinds.

Evolution of Petrol-Electric Car

Early in August of 1924, a petrol powered railcar, with electric transmission was delivered to the Chicago Great Western Railway in Chicago, and later that same month an identical car, in so far as the power plant and transmission were concerned was delivered to the Northern Pacific at St. Paul, of itself, not of the greatest importance, but as events developed, it was actually the beginning of the end of the steam locomotive. These cars were the result of a development which started in 1922, when a new company was formed, known first as the Electro-Motive Engineering Corporation, and later as the Electro-Motive Company, working with the Winton Engine Company, Cleveland, Ohio, who furnished the petrol engine, the General Electric Company, who developed and furnished a special d.c. generator, and also furnished the traction motors; and the St. Louis Car Company, who built the special lightweight car body.

A petrol powered car with electric transmission was not, of itself, a new idea, since the General Electric Company, in the years between 1906 and 1914, had placed about 90 such cars in service on the railways. These cars left much to be desired in the way of controls, power and weight, and apparently were not too well received, as the General Electric Company abandoned the project after the first world war. The results obtained with the pilot models and a demonstrator car, assured the success of this type of car for railway purposes, and by the close of the 1920's, about 500 Electro-Motive petrol electric cars had been placed in service.

It soon became apparent that the limit of the petrol engine had been reached, both as to horse-power, and cost of the fuel. An engine burning a cheaper distillate was developed, and a number were built, notably one of 900 h.p., for an articulated power car for the Atchison, Topeka & Santa Fe Railway, designed to haul about five standard cars. This did not prove very satisfactory and led to the investigation of the diesel engine. Existing designs, including one marketed by the Winton Engine Company, were too heavy and too slow for possible use as a railway prime mover. An attempt to build an engine along the lines of the 400 h.p. petrol engine was unsuccessful because of fuel distribution. To insure accurate distribution of fuel to each cylinder, it appeared necessary to provide individual injectors.

Shortly before this, General Motors was also considering the possibilities of the diesel engine for various purposes, and their Research Department started work on a two-cycle engine, and had reached the same conclusion with respect to the fuel injection system. A Winton diesel was purchased and while the injectors gave trouble, it appeared that the principle was sound. In the factory unit cylinder of about 80 h.p. had been produced, which could be used in building engines of almost any total h.p. The use of this engine was suggested, but the railway thought the matter too important to use an untried prime mover, and selected instead a 12-cyl., 600 h.p., Winton distillate burning engine.

The Chicago, Burlington & Quincy Railroad also was considering a high-speed train, but were planning to use a diesel engine. By this time the first two 8-cyl. engines, for use at the General Motors exhibit at the Century of Progress, in Chicago in 1933, were under construction. While the railway was willing to use this new type engine, General Motors was not, but suggested that the matter be held up pending observation of the performance. In spite of difficulties in keeping the two pilot engines in operation, the railway

High-Speed Operation

Meanwhile, railways were becoming concerned about loss of passenger business. The Union Pacific Railroad approached Electro-Motive late in 1932 for power equipment for a three-car articulated train, for high-speed operation in an effort to recapture some of this business. The railway had in mind a distillate-burning engine, as furnished to the Atchison, Topeka & Santa Fe. By this time the development of the diesel had progressed to where a satis-

The 107-ton DL-701 Bo-Bo diesel-electric locomotive with 70,000-lb. starting tractive effort

conviction that the time was ripe for the introduction of diesel engines for many purposes, General Motors acquired the Winton Engine Company on June 20, 1930, and on December 31, purchased the Electro-Motive Company; the three interests combining in the development of a lightweight, two-cycle, diesel engine.

decided to order a 600 h.p. engine for their new Pioneer Zephyr.

The Union Pacific Railroad train was delivered on February 12, 1934, but so convinced was the management of the possibilities of high-speed, lightweight passenger trains, that on June 30, 1933, a second train of six cars was ordered, to be powered by a two-cycle 900 h.p., General Motors diesel. The "Burlington Zephyr" made its record non-stop run from Denver, Colorado, to Chicago, a distance of 1,015 miles, in 13 hr. 5 min., details of which were given in the October 5, 1934 issue of *The Railway Gazette*. The six-car Union Pacific train was delivered early in October 1934, and it in turn made a run from Los Angeles to New York City, a distance of 3,258 miles, in a running time of 56 hr. 55 min.; the diesel engine was therefore established as a prime mover for high-speed railway services.

Standard Passenger Trains

The success of short streamlined trains, and the economy of diesel-powered units led to serious consideration of diesel engines of higher horsepower to haul standard passenger trains. Electro-Motive Company, anticipating this, ordered a two-unit locomotive demonstrator, each unit having two 900 h.p., two-cycle General Motors diesel engines, a total of 3,600 h.p. This locomotive was built at the Erie Works of the General Electric Company, and was delivered in June of 1935. Some railways, however, were unwilling to wait for completion of the demonstrator—the Baltimore & Ohio Railroad ordering one 1,800 h.p. unit for a new lightweight train, and the Atchison, Topeka & Santa Fe Railway ordered two such units. Thus the introduction of the diesel engine as a prime mover in main line services was the result of the development of a petrol-electric car, into a successful diesel-electric car.

The year 1935 was another milestone in the history of the diesel-electric locomotive. March, 1935, saw the building of a new locomotive works for the Electro-Motive Company of General Motors.

(To be continued)

Emergency Signalling Power Supply for Chelmsford/Southend Lines

Alternator set with automatic starting and load changeover

THE introduction by the Eastern Region of electric services between Liverpool Street and Southend via Shenfield on December 31, 1956, involved alterations to the signalling installed in 1938 and hitherto operated by d.c. between Shenfield and Southend. Track circuits had of course to be changed to operate on a.c., to give protection against extraneous traction current, and provided with impedance bonds. The existing searchlight type colour-light signals were retained but arranged to operate on 110 V. a.c. through step-down transformers and selenium rectifiers. There are 53 three-aspect and 16 four-aspect signals on the Shenfield-Southend section. The 650-V. a.c., 50-cycle main signalling supply is taken from transformers in the traction substations.

Automatic Starting

To provide a standby for this, an alternator set, shown in the accompanying illustration, constructed by A. C. Morrison (Engineers) Limited, has been installed at Ramsden Bellhouse, near Billericay, with automatic starting and load changeover in the event of mains voltage and/or frequency varying outside prescribed limits for periods adjustable from zero to 5 sec. The set is shut down and connection to the mains re-established by push-button.

It comprises, on a common baseplate, a Ruston & Hornsby 3YC type diesel engine, developing 35 b.h.p. at 15 r.p.m., flexibly coupled to a 650-V. 50 cycle single-phase Higgs type alternator with laminated poles and damping windings, excited by a flange mounted d.c. generator, with rolling ramp type automatic voltage regulators.

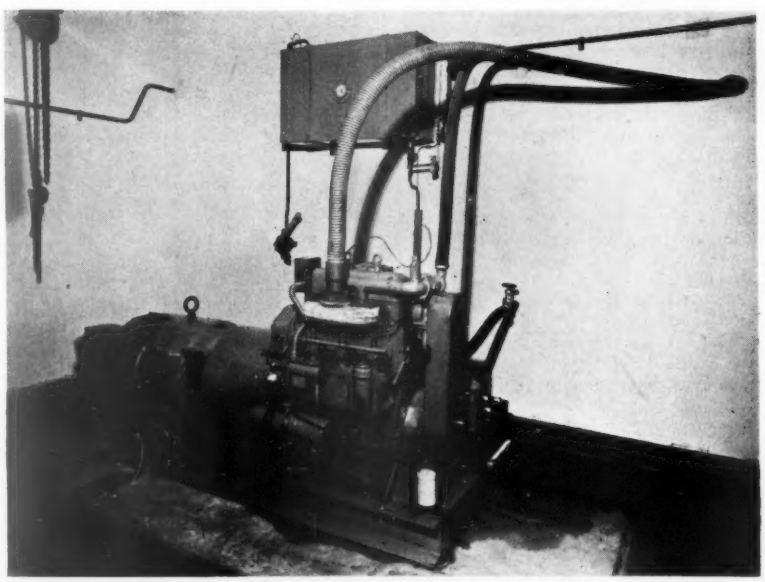
Thermo-syphon cooling tank circulation is assisted by an engine-driven centrifugal pump with thermo-static limiting control until a pre-determined water temperature is reached. There is also a 1kW. immersion heater, thermostatically controlled, maintaining the engine at a reasonable temperature and preventing any chance of freezing in winter. Lubrication is automatic, with the latest safeguards against low oil pressure.

Control Cubicle

The control cubicle contains the 24-V. circuits associated with relay control, and so on, and the 650-V. main control equipment, divided electrically, with complete isolation, to enable one section to be serviced while the other remains alive.

Housing

The modified Shenfield-Chelmsford section was brought into operation in June, 1956, with identical standby equipment at Hylands, near Chelmsford. These self-contained sets are unattended until they go into service under emergency conditions and housed in compact brick buildings adjacent to the main sub-stations.



Diesel standby generating set for providing signalling current in emergencies as installed on Shenfield-Chelmsford and Shenfield-Southend electrified lines, Eastern Region, showing common baseplate assembly

East Coast Main Line Widening Scheme

Earthworks and tunnelling operations in progress at Potters Bar

Cutting between Hadley North and Potters Bar tunnels showing cutting slope graded to initial cut of 1 *in* 4

EARTHWORKS and tunnelling operations have now begun in the British Railways, Eastern Region, £2,000,000 scheme for providing two additional rail tracks to eliminate the 2½-mile-long bottleneck on the East Coast main line between Greenwood and Potters Bar, about 12 miles north of Kings Cross. The first stage of the scheme, including a new station at Potters Bar, was completed in 1955. The works now in progress or to be carried out include the driving of three new twin track tunnels; the widening of the existing cuttings on the Down side of the line; the reconstruction of a span of the road bridge and improvements to the station at Hadley Wood; and the construction of a new 42-in. drainage aqueduct to replace an existing structure. In addition, Greenwood signalbox will be abolished and colour light signalling and track circuiting installed throughout.

Four of the six new tunnel portals have been completed and tunnel boring operations have begun, driving from the south end of Potters Bar tunnel. Considerable progress has also been made in the work of widening the cuttings to accommodate the two additional tracks which will link up with the existing four tracks to the north and south of the works. In addition to actual work on the scheme a factory has been built for the production of the concrete tunnel lining units.

A hutted administration centre for the Resident Engineer's and contractors' staffs has been set up alongside road A.1000 about half a mile south of Potters Bar station, where it crosses over Potters Bar tunnel.

For works identification and administration of this considerable engineering project the works have been allocated on a site basis. The sites are numbered in a northern direction as follows:—

—	*Location*	*Length of works*
Site 1	Greenwood signalbox to portal of Hadley South tunnel (portal No. 1) ..	200 yd. approx.
	Hadley South tunnel ..	383 yd.
Site 2	Between Hadley South (portal No. 2) and North tunnels (portal No. 3) including Hadley Wood station	300 yd. approx
	Hadley North tunnel ..	232 yd.
Site 3	Between Hadley North tunnel (portal No. 4) and Potters Bar tunnel (portal No. 5)	750 yd.
	Potters Bar tunnel	1,208 yd.
Site 4	From Potters Bar tunnel (portal No. 6) to the point where four tracking has been completed south of Potters Bar station ..	425 yd.

Material and spoil from the earthworks is conveyed by a light railway of 2 ft. gauge using 28 diesel locomotives built by Ruston & Hornsby Limited, as motive power. The light railway links sites Nos. 2, 3 and 4 and has branches to the concrete factory and the dumping area for spoil at site 3. The light railway layout includes sidings, loading points at all main areas of operations, a maintenance depot and a marshalling yard. The light railway is carried over the main road to the north by a temporary bridge alongside the administration centre to site No. 4.

In all, about 750,000 tons of spoil from the cuttings and the tunnel bores will be dumped. Cutting widening at site No. 3 is almost complete. The

North end of Potters Bar tunnel with preparatory timbering for the removal of existing wing wall and construction of new portal

earthworks have been carried out by draglines and bulldozers and the cutting slope was graded 1 in 4 as a first stage initial cut. During the second operation drainage counterforts were cut and the grading of the slope altered. At the counterforts the cutting slope is triple graded from 1 in 2·8 at the top of the slope, falling to 1 in 4 in the middle section and decreasing to 1 in 8 at the foot of the cutting. The slope is also graded longitudinally, the highest point about midway between pairs of counterforts is left at the initial gradient of 1 in 4, descending gradually to the triple grading at the counterforts to provide a watershed in both directions.

Work is in progress on sites Nos. 2 and 4. At the former, the down side span of the triple span roadbridge at Hadley Wood station is being reconstructed to provide room for the additional tracks. A new abutment for the span is nearing completion and shortly the girders of the existing span will be removed and the old abutment will be demolished. The new span will consist of standard pre-cast pretensioned concrete beams. When the bridge is complete, earthworks for the rail bed for the two additional tracks on this site will proceed.

At site No. 4 preliminary work for the construction of portal No. 6 at the north end of Potters Bar tunnel is well advanced and earthworks are in progress. Included in the work to be carried out at this site is the aqueduct which is to be replaced by an entirely new structure built alongside the existing aqueduct to avoid any disruption of drainage.

Tunnelling Operations

Preliminary earthworks have commenced at site No. 1 and it is intended to drive the Hadley North and South tunnels in that order, from a northerly direction. Portal No. 1 and the remaining earthworks at site No. 1 will form the later stages of the work.

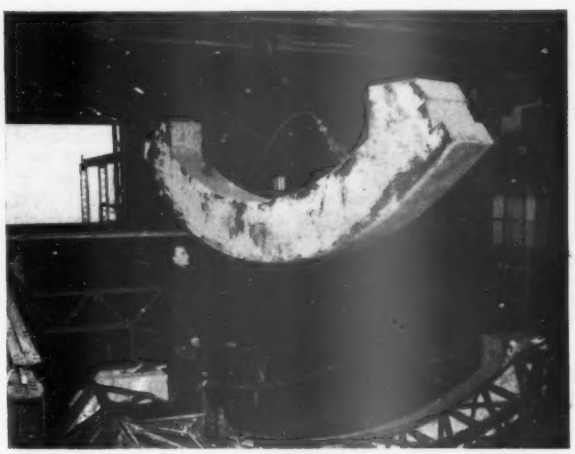
A tunnel shield has been erected at portal No. 5 at the south end of Potters Bar tunnel and boring operations are now in progress. All the tunnels to be driven will be parallel with the existing tunnels and are to be 26 ft. 6 in. in internal bore which will allow sufficient clearance for overhead electrification in the future. The external diameter of the tunnel and shield is 31 ft.

Completed portal ready to receive the tunnelling shield

So far some 30 ft. of the Potters Bar tunnel has been driven and lined with cast iron segments bolted together and pressure grouted with cement. This system of lining the tunnel is to be used at the ends of each of the tunnel bores where there is little overburden of earth and also to form a tube temporarily extended by bolted-on sections outside the tunnel mouth to butt against specially prepared abutments and earthworks. These are provided so that the thrust of the shield may be absorbed as it is forced into the earth by its hydraulic rams.

The temporarily extended tunnel lining tube butts against five king posts which are steel boxpiles driven into the ground. These are stayed by large timberings or wallings wedged against a row of sheet piling driven into the earth and backed by a mound of about 3,000 tons of earth called a dumpling. Spoil is removed from the bore at present by buckets which are craned through an aperture left in the crown of the cast iron tube formed of lining segments extended outside the tunnel.

When sufficient tunnel lining to absorb the thrust of the shield has been installed in the bore, the king posts, the extended tunnel linings, timbering and the earth mound, or dumpling, will be removed allowing free access to the



Reinforced concrete tunnel invert being lifted from a casting bay in the invert shed

Removal of spoil through a hole left in the crown of the extended tunnel lining

tunnel mouth, which will later be faced with Hollington stone. Spoil from the tunnel boring operations will then be removed by a conveyor belt which will be attached to the shield and will move forward with it.

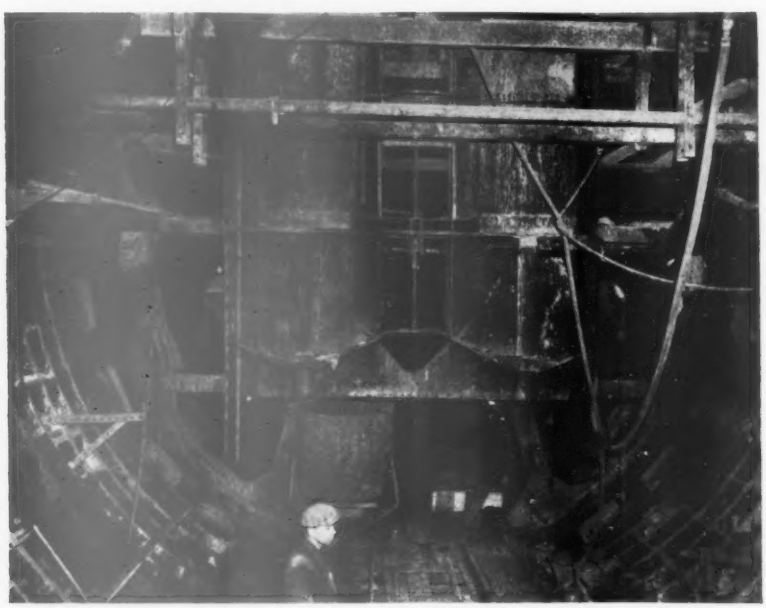
The tunnel shield in use is about 150 tons in weight and has four galleries. On each gallery men excavate the earth, using pneumatic spades, and this is cleared by labourers who shovel it into one of two vertical chutes in the shield which serve all galleries. At the present time the spoil falls down the chute into buckets which are positioned below and are craned out as they are filled. When the conveyor is installed the chutes will feed on to the belt, which will convey the spoil to a hopper loading point over the light railway for removal.

Tunnel Lining

When a sufficient length of the tunnel bore has been driven and lined with cast iron segments, the tunnel lining will subsequently be formed of interlocking concrete segments, or vousoirs. The segments are permanent and are placed in the tunnel in direct contact with and pressing against the earth of the bore. No grouting or bolting is used. The Potters Bar tunnel will be the first tunnel in Britain to be lined in this way.

The concrete segment lining is erected in rings to produce the same result as a bolted up cast iron ring but the method of erection and construction is of interest. Each concrete tunnel lining ring will consist of a reinforced pre-cast concrete invert weighing about 4½ tons, at the base, with three interlocking segments on either side, forming the lower half of the ring. The upper half of the ring is formed of 13 segments, six being erected on either side and held in position by mechanical erectors until the centre or key segment is positioned by a central erector fixed to the rear of the shield. The upper half of the ring is then jacked away from the bottom half, forcing the ring against the earth of the bore, and the resulting space between the upper and lower halves of the ring is filled with a dry concrete mix, forming a complete interlocked ring.

The segments of the ring are interlocked with each other and in turn each ring is interlocked with the next. This is achieved by means of recesses and nibs on the faces of adjacent segments. Two faces of each segment are recessed and two faces have nibs which fit the recesses. The lining segments are cast in concrete using a metallurgical supersulphated acid resisting cement which produces a smooth finish impervious to fumes. Special concrete segments designed to maintain the interlocking are cast for the tunnel rings which have to accommodate workmen's refuges in the tunnel walls and for the apertures for the two ventilation shafts which are to be driven from the surface to the Potters Bar tunnel bore. It is intended to employ a second shield driving from the north end of Potters Bar Tunnel at a later date and a third shield will drive Hadley North and South tunnels in that order.



The tunnelling shield driving from the south end of Potters Bar tunnel

Segments

The factory which has been erected to manufacture the concrete tunnel lining segments consists of two parallel steel-framed corrugated iron clad production sheds fed from an electrically operated common batching plant under push button control by a workman at an elevated console who, from this position, can supervise the batching operations.

The batching plant feeds the aggregate to a separate mixer in each production shed by conveyor belts, but different processes are used in the sheds. One shed specialises in casting reinforced concrete inverts and the other tunnel lining segments. In the invert shed a normal Portland cement concrete mix is used. This shed is equipped with seven steel casting bays laid transversely along its length each with capacity for casting seven inverts. The whole length of the shed, and an area outside, is served by a 10-ton capacity overhead travelling crane.

The concrete mix is poured into wheeled hoppers which are lifted by the crane and placed on a travelling platform which can be moved over any of the casting bays throughout the length of the shed. The platform is fitted with rails which allow the hoppers to be positioned transversely over any point above the casting bay. By the combination of the moving platform and hopper the concrete mix can be distributed to whichever bay is in use, allowing progressive production from bay to bay.

In the second shed tunnel lining segments are cast using cement having the special properties previously mentioned. This cement has to be carefully mixed both in quantities and time and must be cured in a constant temperature. The lining segments are cast in sectioned metal moulds which are dismantled, thoroughly cleaned and oiled between use. The moulds are mounted on rail trolleys and the whole of the shed is laid out with light rail track so that the units can be cast and moved from process to process without disturbance.

In all some 3,500 inverts and about 68,000 lining segments will be produced for the tunnels and it is expected that these will be completed about the end of 1958.

Completed Scheme

It is expected that the whole of the widening scheme will be completed by the end of 1959 when there will be four or more tracks over the 22 miles of main line route from Kings Cross to the Welwyn Viaduct. The constriction of the two tracks through the tunnels to the south of Potters Bar has for many years restricted movement over the line, which at this point carries almost 350 trains daily. When four tracks are available it will be possible to operate more trains and improve working generally over this busy section of the East Coast main lines.

The works between Greenwood and Potters Bar are being carried out under the general direction of Mr. A. K. Terris, Chief Civil Engineer, Eastern Region, and Sir William Halcrow & Partners are the Consulting Engineers. The Resident Engineer is Mr. T. N. C. Bulman, and the contractor for the tunnelling and widening works is Charles Brand Limited, under the direction of their Agent, Mr. J. A. M. Clark.

RAILWAY NEWS SECTION

PERSONAL

Mr. Saghir-ud-Din Ahmed Suhrwardy has been appointed Director General (Railways), Railway Division of the Ministry of Communications, Pakistan.

Mr. W. S. Morgan, who, as recorded in our April 5 issue, has been appointed Director of Audit, British Transport Commission, was educated at Sherborne School and became a member of the Institute of Chartered Accountants in 1928 after five years of service as an articled clerk with a City firm. As a professional accountant he gained a wide and varied experience of audit and investigation work on the Continent and, in 1936, was appointed Chief Accountant to a group of mining companies operating in South Eastern Europe. During the war he served with the Special Operations Executive, after which he spent 18 months with the Finance Division of the Ministry of Transport before joining the service of the British Transport Commission in December, 1947.

Mr. W. S. Morgan
Appointed Director of Audit of the British Transport Commission

Mr. N. R. Bellwood
Appointed Director of Funds & General Division, British Transport Commission

We regret to record the death on April 28, at the age of 90, of Sir Murdoch Macdonald, former M.P. for Inverness-shire and a member of the group of British civil engineers whose fame rests on the irrigation works that now control and distribute the waters of the Nile. The most famous project for which he was responsible was the Aswan Dam. Sir Murdoch Macdonald began his career as a civil engineer with the former Highland Railway in the Chief Engineer's office at Inverness and was the Resident Engineer on the Black Isle Line construction and the Dalnaspidal-Blair Athol widening.

Mr. G. Crabtree, District Operating Superintendent, Edinburgh, Scottish Region, British Railways, has been appointed Assistant to Chief Operating Superintendent (Modernisation).

Mr. R. L. Charlesworth, Principal Traffic Costing Officer, Paddington, British Transport Commission, has been appointed Assistant to the General Manager, Western Region, British Railways.

Mr. James B. Thom, European Manager, Canadian National Railways, is retiring. He will be succeeded by Mr. Joseph C. Kenkel, Assistant to Vice-President of Operations, C.N.R. The appointment takes effect on July 1.

Mr. N. M. Reiners has been appointed Vice-President (Research) of Cummins Engine Company Inc., Columbus, Indiana.

Mr. C. R. Pasley has retired after 36 years of service with the Eyre Smelting Co. Ltd. For many years he has been in charge of the company's Railway Division and in this connection has visited railways overseas on a number of occasions. Mr. Pasley will maintain contact with the company in a consultative capacity.

Mr. N. R. Bellwood, A.C.A., M.Inst.T., who, as recorded in our April 5 issue, has been appointed Director of Funds & General Division, British Transport Commission, was born at Nunthorpe, near Middlesbrough, and was educated at the Leys School, Cambridge. He was articled with Messrs. Peat, Marwick, Mitchell & Company, Chartered Accountants, and admitted as a Member of the Institute of Chartered Accountants in 1935. In 1945, he was appointed Chief Accountant of the Transport Services Limited Group. Mr. Bellwood was appointed Chief Accountant of British Road Services in February, 1948, and, in 1950, became Chief Financial Officer.

Mr. A. R. W. Low, M.P., formerly Minister of State, Board of Trade, has been appointed a director of Dorman Long & Co. Ltd.

Mr. R. G. H. Taylor, a director of the English Steel Corporation and Managing Director of Taylor Bros. & Co. Ltd., will be Chairman of Canadian Steel Wheels Limited, the corporation's newly-formed subsidiary (referred to elsewhere in this issue). Mr. A. C. MacDonald, President of Canadian Steel Foundries (1956) Limited, will be President.

Metropolitan-Vickers Electrical Co. Ltd. announces that as from March 1, 1957, the Traction Department was organised as a division of the company. From the same

date Mr. F. Whyman has been appointed Chief Engineer, Traction Division, in addition to his duties as Chief Engineer, Traction Projects Department. The new division will co-ordinate all the company's traction interests, including thos in the Stockton works of Metropolitan-Vickers—Beyer, Peacock Limited.

Mr. J. E. M. Roberts, who, as recorded in our April 19 issue, has been appointed Director of Training & Education in the Manpower Adviser's Department of the British Transport Commission (see editorial position as Assistant Traffic Adviser (Passenger). For some years a member of the Oxford University Appointments Committee, he is a member of the Commission's Central Selection Committee for Traffic Apprentices.

Mr. Enrique Piumazzi, who, as recorded in our December 7 issue, has been appointed Chief of the Traffic Department of the D.F. Sarmiento Railway, Argentina, was born in Lincoln (province of Buenos Ayres) in 1903 and began his railway career in 1914. He was appointed Station Assistant in 1918, and transferred to the Train

Mr. W. G. Girling has retired from the board of General Refractories Limited.

Mr. Charles J. Howard and Mr. Christopher R. Thompson have been appointed directors of John Thompson Limited.

Mr. A. S. C. Chattey has been appointed Chairman of A.C.V. Sales Limited and Mr. P. Rackham, Home Sales Manager, has been appointed a director of that company. Mr. Chattey has been invited to join the board of the parent company, Associated Commercial Vehicles Limited.

Mr. J. E. M. Roberts

Appointed Director of Training & Education, British Transport Commission

Mr. E. Piumazzi

Appointed Chief, Traffic Department, D.F. Sarmiento Railway

April 19), is a graduate of Oxford University. He entered the service of the L.N.E.R. in 1929 as a Traffic Apprentice, and, from 1934 to 1937, was employed in the Staff Section of the Chief General Manager's Office. In 1939 he was appointed head of the Staff Section of the Divisional General Manager at York, and, in the following year, became Assistant District Superintendent, York. In 1941 Mr. Roberts was appointed District Superintendent, Sunderland, moving after two years to a similar position at Darlington. In 1944 he was made Assistant Divisional General Manager, York, and, in 1947, Passenger Manager of the North-Eastern Area, L.N.E.R. In March, 1949, he was transferred to the Southern Region as Assistant Commercial Superintendent, but shortly afterwards was appointed to R.E. Headquarters as Executive Officer (Rates & Charges) with special responsibility for Passenger Charges Schemes. In 1954 Mr. Roberts became Chief Passenger Officer at Commission Headquarters, and in January, 1955, was appointed to his present

Control Officer a year later. On the formation of the Central Train Control Office in Once he was chosen for the operating staff after examination. In 1939 he took over the staff diagram section, reaching the category of Divisional Chief in 1955, when he was placed in charge of train operation. Three months later he was appointed Assistant Chief of the Traffic Department, and, shortly afterwards, became Chief of that Department.

Mr. J. P. Bennett and Mr. J. Cartwright have been appointed directors of Taylor Bros. & Co. Ltd., a subsidiary of the English Steel Corporation Limited, with effect from March 26, 1957. There will be no change in their executive duties.

The Mobil Oil Co. Ltd. announces the formation of a Consumer Fuels Sales Department. The Manager of the new department is Mr. A. Peck who for a number of years was the company's Divisional Manager in Cardiff.

Major-General Sir Richard Lewis has been appointed to the board of Associated British Engineering Limited as a non-executive director.

Mr. W. A. J. Sayer, until recently Assistant General Manager of the Machinery Division of George Cohen Sons & Co. Ltd., has been appointed Managing Director of George Cohen Sons & Co. (South Africa) (Proprietary) Ltd., and will shortly take up residence in South Africa.

Mr. P. A. Langley, A.M.I.E.E., M.I.R.S.E., appointed Assistant Signal Engineer (General), Eastern Region, British Railways, was educated at Norwich High School and later served an apprenticeship with the former Midland & Great Northern Joint Committee. In 1925 he became a junior draughtsman in the Signal Engineer's Department of the former L.N.E.R. at Liverpool Street and, in 1928, transferred to the Telegraph Superintendent's Office. Mr.

Mr. P. A. Langley

Appointed Assistant Signal Engineer (General), Eastern Region

Mr. H. R. Chubb

Appointed Regional Welfare Officer, Western Region

The late Mr. Gilbert S. Hill

Welfare Officer, L.M. Region, 1952-57

Langley left the L.N.E.R. in 1929 to take up an appointment in the Divisional Signal Engineer's Office of the L.M.S. at Derby. After holding various senior positions at Derby he became Electrical Assistant to the Signal Engineer, London Midland Region, at Euston in 1953. In 1956 Mr. Langley was appointed Maintenance Assistant to the Signal Engineer, Euston, the position he has now left.

Mr. H. R. Chubb, whose appointment as Regional Welfare Officer, Western Region, British Railways, was recorded in our April 26 issue, joined the Great Western Railway in 1925 in the office of the Divisional Superintendent at Swansea where he gained varied experience until 1929. He was subsequently employed at a number of stations in the Swansea and Exeter divisions and later transferred to the Superintendent of the Line's Office at Paddington. In 1938 he was promoted to the General Manager's Office where he remained until 1946, when he was appointed Principal Clerk in the former Chief Staff & Establishment Officer's Department. In this capacity he was closely concerned with the early development of the welfare arrangements on the Western Region, particularly hostels, canteens and improved working conditions generally in all departments. Mr. Chubb was appointed Assistant Regional Welfare Officer, the position he now vacates, in 1950.

We regret to record the death on April 27, at the age of 63, of Mr. Gilbert Hill, Welfare Officer, London Midland Region, British Railways. Mr. Hill began his railway career on the Lancashire & Yorkshire Railway in 1909. From then until 1922 he served under the Chief Traffic Manager and Chief Goods Manager, and, in 1923, was transferred to the department of the Chief General Superintendent, Western Division, L.M.S.R. Two years later he was appointed full-time General Ambulance Secretary for the system. Mr. Hill had been actively concerned with the railway ambulance movement since 1916. He was an Officer Brother of the Order of St. John of Jerusalem, Chairman of the Railway Ambulance Central Representatives Committee from 1945 until 1952, and a member of the Railway Executive Committee on first aid matters. In 1934 he became Divisional Welfare Supervisor & General Ambulance Secretary. He was appointed Welfare Officer of the London Midland Region in 1952.

The funeral took place at Golders Green Crematorium on April 30.

In addition to the family mourners the following serving and retired railway officers were present:—

Messrs. H. Aidley, Regional Establishment & Staff Officer, Euston (also representing Mr. D. Blee, General Manager, London Midland Region); H. R. Broom, representing A. E. Poston & Co. Ltd.; J. Carr, Audit Accountant's Department, Watford; J. B. Chadwick, Assistant Estate & Rating Surveyor; H. R. Chubb, Regional Welfare Officer, Western Region (also representing Mr. S. G. Ward, Regional Establishment & Staff Officer, Western Region); R. Collins, Regional Accountant's Office, Euston; H. J. Comber, former Chief Officer for Labour & Establishment, Euston; C. F. Cox, Regional Establishment & Staff Office, Euston; I. Davies, Area Welfare Officer, St. Pancras; W. R. Davies, former Assistant to Regional Establishment & Staff Officer (and representing British Transport Officers' Guild); L. F. Dewick, Regional Establishment & Staff Office, Euston; E. Fleet, formerly Regional Establishment & Staff Office, Euston; A. T. Gosden, Regional Pensions Officer, Euston; D. C. J. Grover, Assistant to Estate & Rating Surveyor, Euston; E. Grundy, Area Welfare Officer, Birmingham; G. J. Harris, Regional Accountant, Euston; W. W. Harris, Recruiting Officer, Euston; H. Healey, Regional Ambulance Secretary, Euston; N. Horner, Assistant Accountant, Euston; E. A. Humphries, Regional Establishment & Staff Office, Euston; F. L. Jagger, Assistant (Salaried Staff), Regional Establishment & Staff Office, Euston; F. Kelland, Area Welfare Officer, St. Pancras; Miss H. B. Laws, Women's Welfare Officer, Euston;

Messrs. R. A. Laird, Assistant Regional Welfare Officer, Eastern Region, Liverpool Street (also representing Mr. C. S. McLeod, Regional Establishment & Staff Officer, Eastern Region, and Mr. A. T. S. Rayner, Regional Welfare Officer, Eastern Region); W. E. C. Lazenby, former Assistant Chief Officer for Labour & Establishment, Euston; J. Lithgow, Regional Welfare Officer, Southern Region (also representing Mr. H. C. Lang, Regional Establishment & Staff Officer, Southern Region, Waterloo); A. E. Lloyd, Regional Establishment & Staff Office, Euston (also representing Mr. A. H. Nicholson, Assistant (Wages Staff), R.E. & S.O., Euston); J. A. Madeley, Area Welfare Officer, Crewe; J. A. MacIntosh (representing Mr. W. F. Humphreys, General Secretary, L.M. Staff Association, Euston); K. L. Mallory, Assistant to Chief Commercial Manager, Euston; J. P. Mead, Secretary, Railway Staff Conference, Westminster; J. A. Miller, Area Welfare Officer, Rugby (also representing Mr. J. E. Whitehouse, Assistant Regional Welfare Officer, Euston); G. Morris, Regional Establishment & Staff Office, Euston; J. Neal, formerly Regional Staff Office, Euston; J. G. Norton, Assistant Regional Establishment & Staff Office, Euston; R. A. Odell, former Assistant Regional Welfare Officer, Euston (also representing Mr. F. Barrett, Regional Welfare Officer, North Eastern Region, York); J. Peate, representing Transport Salaried Staffs' Association; T. Phillips, Area Welfare Officer, Birkenhead; T. L. R. Presland, Audit Accountant, The Grove, Watford.

Messrs. H. E. Redfern, Federation of L.M.R. Horticultural Societies (also representing Midland Division Horticultural Society, Derby); J. E. Roberts, Area Welfare Officer, Lancaster; J. Robertson, Regional Funds Office, Euston; E. G. Savage, Regional Establishment & Staff Office, Euston; A. T. Shaw, Regional Establishment & Staff Office, Euston; R. Simpson, former Regional Staff Officer, Euston; F. A. Trott, Regional Ambulance Secretary, Southern Region, Waterloo (also representing B.T.C. Headquarters First Aid Committee and Standing Committee of Railway Ambulance Centre Representatives); J. Warren, representing District Goods Manager, Broad Street; R. J. Wendon, Regional Establishment & Staff Office, Euston; O. J. F. Whitaker, British Transport Commission (also representing Mr. W. P. Allen, Manpower Adviser, and Mr. C. A. Humphries, Welfare); H. Wilkinson, Regional Establishment & Staff Office, Euston; R. H. Willcox, Regional Establishment & Staff Office, Euston; A. E. Willingale, Regional Establishment & Staff Office, Euston.

NEW EQUIPMENT AND PROCESSES

Locomotive Component Washing Plant

INSTALLED recently at the Caerphilly Locomotive Repair Shops, Western Region, is a special-purpose machine for the automatic cleaning of wheel sets and small parts. High powered jet or spray cleaning is the basis of the actual washing process; the cleaning medium is an alkaline solution made from a chemical cleaning compound.

The machine comprises two sections—one for the cleaning of locomotive wheel sets and the second for miscellaneous components. Each section can be operated separately, although other similar machines have provided simultaneous operation of both sections.

The upper part of the machine comprises a spray chamber in which the dirty wheel sets are placed by means of a hoist or gantry and subjected to sprays for a period of 5 to 10 min., dependent on the extent of dirt and grease on the wheels, journals, and other parts.

The lower section comprises a tunnel with a powered conveyor and separate entry and exit. Through this section trays of components from the locomotive are passed through and a separate system of sprays provides a thorough cleaning in a 5-min. cycle.

The upper section of the machine is fitted with a shutter-type door, which is closed or opened as required with a high speed motion. Guide rails ensure the correct positioning of the wheel set. The lower section has rubber curtains and splash areas at each end to ensure that splash and vapour are contained within the machine. Fume ducting takes the excess steam to atmosphere and, dependent on local conditions, the natural draught is sufficient.

A further feature of this unit is the provision of automatic sludge removal from the machine. The dirt from wheels or components falls to the bottom of the solution tank and the conveyor of the lower section has a scraper action, taking the sludge to a point where it is pumped to a separate settling tank located outside the building. The illustrations show a general view of the plant, with locomotive wheel set, and a tray of components passing through the rubber curtains on the conveyor.

Other machines have been designed for the cleaning of rolling stock wheel sets, axleboxes and so on. The manufacturers, Edward Curran Engineering Limited, Process Plant Division, Cardiff, are prepared to design similar installations to suit individual applications.

Portable Fluorescent Lighting

PORTABLE fluorescent lighting units which may be operated from a battery by means of a special converter unit now available appear of application to night-time construction work, track maintenance, emergency inspection and so on.

The units can also be arranged to operate from normal mains supply. Designed to operate from a low voltage supply each unit is fitted with two 18-in. 15-W. warm white instant start fluorescent tubes which, it is stated, will provide two to three times the light output of a normal tungsten lamp for the same current consumption.

The tubes are housed in a corrosion resistant cast aluminium alloy case which is fitted with a diffused perspex lens, and has four mounting bosses for easy fixing or erection in any position.

Each lighting unit is provided with a male and female connector which makes possible the linking of up to six units to be operated in a row.

For maintenance, the removal of the lens and its retaining frame gives access to all component parts.

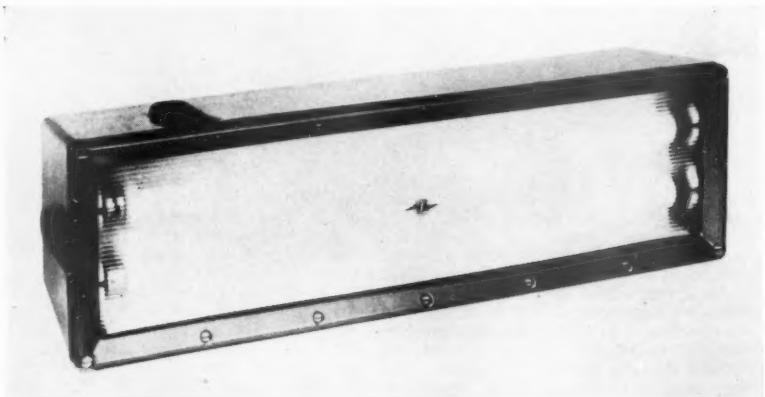
Each unit has an approximate weight of 18 lb. and a current consumption of 1.8 A. on a 28-V. d.c. supply. In addition they can be supplied for 12 or 24 V. d.c. and for low voltage a.c. supplies. Provision is also made for mains connection if required.

The unit houses a vibrator, step-up transformer and associated control gear, the circuit being so designed that the vibrator operates at unity power factor, thus ensuring a long and efficient life.

The units can be delivered in about two to three months. The price can be obtained on application to the manufacturer, Easco Electrical (Holdings) Limited, Brighton Terrace, London, S.W.9.

Foundry Refractory Products

A NEW range of refractory products to be marketed under the brand name Black Sal, is of application to both ferrous and non-ferrous railway foundries. Individually they are called Black Sal No. 900 Cement, Black Sal No. 1,000 Plumbago Plastic Ramming Material, and Black Sal No. 2.000 Stopper Plugging Compound. Basically they are plumbago—silicon carbide plastic refractories needing only the addition of water to be ready for use.



Black Sal No. 900 is a plumbago-silicon carbide based cement primarily intended for jointing plumbago ware; it can also be used as a refractory washcoat.

Black Sal No. 1,000 is a super quality plumbago—silicon carbide plastic ramming material for use in the foundry. It is stated to have excellent resistance to thermal shock, and be resistant to corrosive attack from molten metals, slags and most fluxes. The self-glazing properties of No. 1,000 Cement restricts oxidation when heated to a temperature of 1,400-1,500° C. in an oxidising atmosphere. It can be used as a damp dust, a soft damp dust, or as a soft plastic. As a damp dust it is excellent for ramming behind formers, as a soft damp dust it

is excellent for hand hammering without formers or for moulding shape parts, and in the plastic form it is useful for hand daubing and repairing cracks.

Black Sal No. 2,000 is a high quality plumbago stopper plugging compound. It is very resistant to erosion making it the ideal compound for safeguarding against the loss of the stopper plug in bottom-pour ladles.

Refractories from the Black Sal range are being sold in 7-lb. and 28-lb. tins and 112-lb. drums. Larger amounts can be delivered in casks. The price and delivery will be quoted on application to the manufacturer, the Morgan Crucible Co. Ltd., Battersea Church Road, London, S.W.11.

Spot Welding Gun

A SPOT welding unit, the A.R.O. model G.410, which has been specially designed for the assembly of railway vehicles and diesel locomotives, is now being made commercially available.

The G.410, a mobile unit, developed

for the construction and repair of large sheet metal bodies, is air operated and weighs 52 lb. A built-in suspension is incorporated, which gives easy movement in all directions and leaves one side of the unit unobstructed, obtaining complete mobility without fatigue. Cooling the unit is by means of water, the consumption being approximately 75 gal. per hr.

The G.410 can weld two mild steel sheet components of up to $\frac{1}{8}$ in. each, and is controlled by a separate weld timer, which is equipped with a thermic energy control (for welding rusty or scaly sheets), as well as a monitoring safety device.

The maximum throat depth of the gun is 20 in. with a maximum distance between the arms of nearly 15 in. The forging pressure is approximately 450 lb. and air pressure required from 55 to 100 p.s.i. The tip dia. of the electrodes is $\frac{3}{4}$ in., stroke is $1\frac{9}{32}$ in., and the maximum gap between tips (unhooked) is $2\frac{7}{8}$ in.

The dimensions of the unit are: closed height, $11\frac{7}{32}$ in.; width, $7\frac{1}{4}$ in.; length, with standard arms, $27\frac{1}{8}$ in. A design feature is the built-in watercooled weld transformer by which both primary and secondary windings are cooled, which eliminates heavy secondary link cables.

The G.410 is available for quick delivery, and costs, complete with timer and suspension, less than £300. The manufacturer is the A.R.O. Machinery Co. Ltd., 190, Castelnau, S.W.13.

Portable Four-Tool Diesel Compressor

AN addition to the Bristol range of self-contained compressor units is Model ATS/270/PD.4 suitable for railway civil engineering constructional work.

This heavy-duty four-tool plant, designed on the Bristol Duplex principle of double-acting two-stage compression, has a free air delivery of 230 c.f.m. at 100 p.s.i.g. when running at 1,400 r.p.m.

Removable sections simplify cleaning and maintenance of the high-capacity intercooler, which has a fully automatic drain valve controlled by the pilot unloader. The latter maintains air pressure within $\pm 7\frac{1}{2}$ p.s.i. of a pre-determined value, which can be arranged to suit particular requirements. A speed control, also operated by the pilot unloader, reduces the engine speed when the compressor is idling, thus saving fuel, and a time-lag control automatically restores full r.p.m. before the compressor comes back on load.

A 1,595 cc. Dorman 4-cylinder 60 b.h.p. diesel engine with pumped water cooling and force-feed lubrication drives the compressor through a Rockford single-plate segmental disc clutch $11\frac{1}{2}$ in. in diameter. The large capacity tropicalised and cowled radiator is fan-cooled and equipped with a thermostatic temperature control. The 12-V. electrical system incorporates a heavy-duty starter motor.

At the rear of the chassis a 29-gal. fuel tank and a $12\frac{1}{2}$-cu. ft. air receiver are mounted. The road wheels are fitted with 6·00 × 16 pneumatic tyres and are fitted with 10-in. diameter Girling over-run brakes. Steering is on the Ackerman principle. Refinements include an instrument panel at one side of the machine and a roof canopy with folding side-shutters affording a high degree of protection. Batteries and toolkit are housed in streamlined side cowlings which also serve as wings for the front pair of road-wheels.

Price and delivery details may be obtained from the manufacturer, Bristol Pneumatic Tools Limited, Fishponds, Bristol.

Wide Shovel Attachment for Bulk Handling

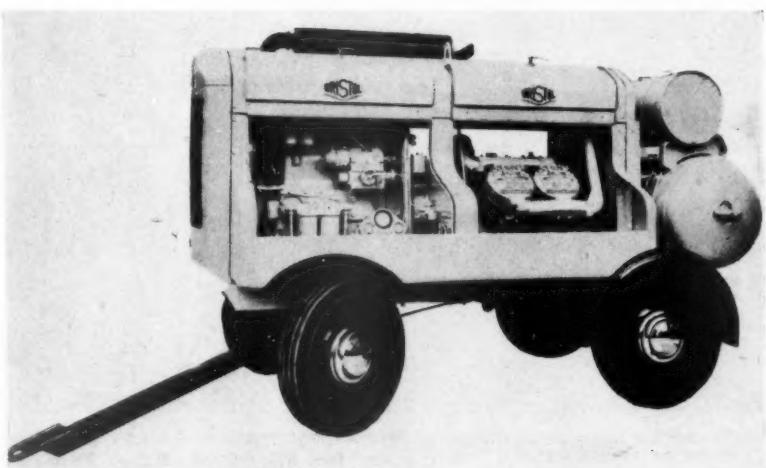
THE manufacturer of the Dozaloda, a bulldozer and power shovel designed for earthmoving operations and so on, has introduced a 6-ft. wide shovel attachment for use with the unit.

Railway applications of this equipment include bulk handlings of loose materials such as coal and coke in works, coal yards and so on, as well as earthmoving projects. Other attachments of the machine include a fork lift and bulldozer blade which make the machine very versatile.

The capacity of the bucket is $\frac{1}{8}$ cu. yd. Manganese teeth are fitted as standard, but the shovel can be supplied with a knife edged blade. The width of the shovel is stated to spread the dumping load more evenly on a lorry.

Dozaloda equipment can be mounted on either the four-wheel drive or the standard Fordson Major tractor fitted with large wheel equipment. With either version the rear end is left free, enabling a mounted compressor to be fitted.

The shovel attachment can be delivered in 14 days. Price details of this and other equipment are obtainable from the manufacturer, Whitlock Bros. Ltd., Great Yeldham, Essex.



Inspection of Beyer-Garatt Locomotives for Rhodesia

Visit to the Gorton Works of Beyer, Peacock & Co. Ltd.

Some 40 guests, who included Sir Gilbert Rennie, High Commissioner for the Federation of Rhodesia & Nyasaland, visited the Gorton Works of Beyer, Peacock & Co. Ltd., on April 24 to inspect some of the "20A" class, Beyer-Garratt, 3 ft. 6 in. gauge locomotives, 46 of which are being supplied to the Rhodesia Railways. The locomotives are basically similar to the "20th" class described and illustrated in our issue of January 28, 1955—the principal difference is in the outer bogie wheel dia., which has been increased from 2 ft. 4½ in. to 2 ft. 9 in.; there is also an increase in coal carrying capacity.

The party travelled in a reserved coach in the 8.30 a.m. express from Euston to Manchester at the invitation of Mr. Harold Wilmot, Chairman & Managing Director, and the Directors of Beyer, Peacock & Co. Ltd., and was entertained to luncheon at the Midland Hotel, Manchester.

Railway Expansion

Mr. Harold Wilmot, addresssing the gathering after luncheon, welcomed the guests and, in proposing the toast of the Federation, said that he wished to couple this toast with that of the Federation, the Rhodesia Railways, and the High Commissioner, Sir Gilbert Rennie. He mentioned his company's long association with the Rhodesia Railways, which had been continuous for more than 30 years, and pointed out that the bulk of heavy traffic on that system was moved by Beyer, Peacock locomotives.

The developments in Rhodesia, he added, had been tremendous, and Beyer, Peacock & Co. Ltd. was pleased to make some contribution to its development. Mr. Wilmot also emphasised the outstanding service rendered to the Commonwealth by Sir Gilbert Rennie.

Sir Gilbert Rennie, in reply, thanked the Chairman and directors of Beyer, Peacock & Co. Ltd., for their generous hospitality and the opportunity afforded of seeing the new locomotives. He referred to the long association between the Rhodesia Railways and Beyer, Peacock & Co. Ltd; more than half the locomotives on the Rhodesia Railways, he pointed out, had been supplied by that firm, representing some 70 per cent of the total tractive effort. The Rhodesia Railways carried two-and-a-half times the traffic they had moved 10 years ago, and there was a steady increase in industrial and commercial activity in the Federation. In fact, the population had more than doubled since 1946. Those present included:—

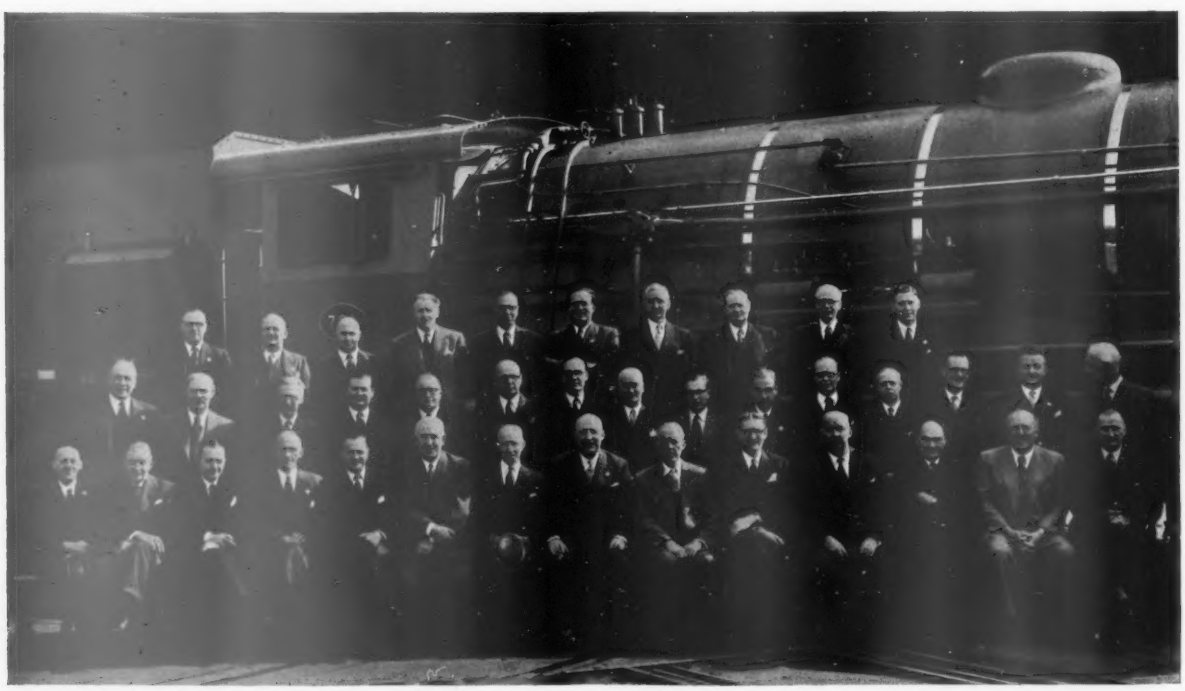
Sir Gilbert Rennie, High Commissioner, and Mr. J. W. M. Fitt, Deputy High Commissioner, Federation of Rhodesia & Nyasaland; Messrs. O. S. Naylor, London Agent, and L. A. W. Hawkins, Principal Executive Officer (Technical), Rhodesia Railways; D. C. Brown, Chief Mechanical Engineer, Crown Agents for Oversea Governments & Administrations; Admiral Sir Sydney Frew, Chief Fuel Officer, Ministry of Fuel & Power.

Messrs. R. H. Dobson, Managing Director, Antofagasta (Chili) & Bolivia Railway Co. Ltd.; Luis Lane, Benguela Railway Company; R. E. Fordham and F. E. Hough, representing Messrs. Freeman, Fox & Partners, Consulting Engineers, Rhodesia Railways; L. W. Robson, Chairman, Associated British Engineering.

Beyer, Peacock Co. Ltd.: Messrs. Harold Wilmot, Chairman & Managing Director; M. A. Crane, Technical Sales Manager; M. A. Lockhart, Technical Representative; L. T. Dawes, Commercial Director; H. Lane, Works Manager; D. Patrick, Design Superintendent; H. Holden, Chief Cashier; J. Crowther, Chief Accountant; M. Sunderland, Assistant to Technical Director; H. Kennedy, Secretary; J. Lowe, Chief Draughtsman.

British Transport Commission: Messrs. R. F. Harvey, Chief Operating & Motive Power Officer, British Railways Central Staff; T. E. Chrimes, Motive Power Superintendent, and M. G. Burrows, Assistant Mechanical Engineer, British Railways, Southern Region; W. N. Roberts, District Passenger Manager, London, London Midland Region; C. E. R. Sherrington, Director, Research Information Division; D. R. Carling, Superintendent, Rugby Testing Station.

"TRANS EUROPE EXPRESS" SERVICES.—The names to be borne by the new diesel trains forming the "Trans Europe Express" network of diesel trains introduced in the summer timetables have been announced. The existing named services to be incorporated in the T.E.E. network will retain their present names of "Helvetia" (Zürich-Hamburg), "Rhein-Main" (Amsterdam-Frankfort), "Paris-Ruhr" (Paris-Dortmund) "Saphir" (Ostend-Dortmund), "Mont-Cenis" (Lyons-Milan), and "Edelweiss" (Zürich-Brussels-Amsterdam), while the Paris-Amsterdam evening train will take the name of the "Etoile du Nord" Pullman train and the Paris-Zürich service will be named "Arbalète" ("Crossbow") in honour of William Tell. Of the new trains, the morning Paris-Amsterdam service will be known as "Ile de France," the Paris-Brussels evening train as "Oiseau Bleu" (the present Pullman train of this name becoming unnamed), the Marseilles-Milan service will be "Le Ligure" and the Milan-Munich train "Mediolanum" (the Latin name for Milan).



During the inspection at Gorton of Beyer-Garratt "20A" class locomotives for Rhodesia Railways; Mr. Harold Wilmot is eighth from left, with Sir Gilbert Rennie on his right

Restoring the Working at Cannon Street

The bringing into service on May 5 of a temporary power signalbox at Cannon Street will facilitate greatly improved suburban electric and revised long-distance services

In the early hours of April 5, as reported in our April 12 issue, fire broke out in the electric power signalbox at Cannon Street Station, Southern Region. All efforts to subdue the flames proved unavailing and the whole of the equipment housed in the box was virtually destroyed, shutting down completely this important City terminus which normally handles at its eight platforms 206 incoming and 211 outgoing trains daily, carrying in all some 73,000 passengers. Many of these trains at peak traffic periods are steam services from and to the coast, conveying a large residential traffic.

Emergency measures were organised as rapidly as possible and train services rearranged to reduce to a minimum the inevitably great inconvenience to the public arising from the calamity, but the crowded state of the approach lines and heavy loading already obtaining at the other Southern Region London stations necessarily limited what could be done in this direction. Steam services were diverted to Victoria or stopped short at various points, while facilities were afforded for season and other tickets to be used over alternative routes and L.T.E. connecting lines. A special bus service was arranged between London Bridge and Cannon Street and every endeavour made to keep passengers well advised of the position and direct them by the best available routes. Much criticism became directed against those concerned in dealing with the emergency but very few persons could have any appreciation of the magnitude of the tasks involved, first in putting the altered services into operation, itself involving a very great amount of work, and then replacing the destroyed equipment. By resorting to hand signalling it proved possible to run a restricted electric service of 22 incoming trains between 7.0 and 10.0 a.m., instead of the normal number of 52, and 25 outgoing ones between 4 p.m. and 7 p.m., instead of 51; with this went some appreciable increase in the already very heavy loading in and out of Charing Cross. These trains of course required no locomotive shunting, a serious obstacle to handling steam services under the circumstances.

Signalling Installation

The burnt-out box was brought into service in June, 1926, with one at Charing Cross of similar type, in connection with the continuous track circuiting and four-aspect colour-light signalling then being installed at these stations and on the connecting lines to give the improved facilities required by the introduction of electric services. The track layout at Cannon Street was remodelled entirely to provide routes from every platform to both down through and local lines, and from the corresponding up lines to every platform, except No. 1, accessible from the up through only. A large amount of conditional interlocking—in this case of mechanical type—was therefore required in the frame, of Westinghouse Style K pattern with 140 working levers. (This replaced the former Nos. 1 and 2 mechanical boxes, with a total of 375 levers). The box contained some 400 relays and of course other electrical equipment, much cabling, wiring, and such. It was built of wood, but this did not of itself present any unusual fire risk, and it survived serious incendiary and high explosive attacks in the war. All evidence of the exact cause of the fire was destroyed but it appears to have originated with a cable fault, leading to arcing against which the electrical safeguards proved unavailing. There was no lack of fire fighting equipment, but the flames spread more rapidly than the staff could cope with them.

No reserves equivalent to the equipment of a complete box ever have been maintained, nor is there such a thing as a "reserve box." In any case the frame itself is the least complicated item of equipment involved. Some of that required to remedy the damage, including cables, has yet to be manufactured but is on order. It was decided that the best course would be not to attempt to rebuild the box at the old location but to construct a new one south of the station in the improved fireproof style of building used for some time now in all new work, embodying the latest known improvements and affording speedier operation than did apparatus installed some 30 years ago.

In view of the large amount of highly specialised work involved, much of it conditioned by circumstances of the particular location, limiting the extent to which labour can be deployed, an estimated completion date of the end of the year was thought reasonable, but every effort is of course being made to better that.

Temporary Signalbox

A 47-lever power frame, borrowed from the London Midland Region, has been installed in what was the staff accommodation of the destroyed box and is being brought into service on Sunday next, May 5, enabling platforms Nos. 1 to 5 to be opened for normal working with full signalling, while by means of a new connection between up local and through lines platform 6 will, from about the middle of the month, be able to take some 12-car trains. (It is only long enough as yet for 10 cars but an extension is being provided and meanwhile passengers will enter and alight from the overhanging coaches through the corridors.) This will entail a little more temporary, possibly some hand, signalling for the time being. The controls operated from the temporary box will provide in every respect the same standard of protection for train movements as is given by any other power worked signal box in the Region.

Improved Services from Cannon Street

Two 12-car diesel-electric trains will commence running on May 6, ahead of the summer time table, working from and to Hastings, but the remainder of the Hastings business trains will be concentrated at Charing Cross and will call at Waterloo, except one up train which will terminate at Tonbridge, from which connections onwards will be provided. As many as possible also of the Kent Coast trains via Chatham and Ashford will be dealt with at Charing Cross and call at Waterloo, or will in the heaviest peak period start from London Bridge. The remaining five each way will continue to use Victoria or terminate at and start from the fringe of the electrified area, whence London can be gained by other means. The suburban electric service from all routes will be very much improved but details remain to be worked out. The Saturday service to commence on May 11 is not yet complete but on and from May 5 the advertised Sunday service from Cannon Street will run with perhaps a few minor adjustments.

The following main-line business services are announced to run as from May 6:—

Hastings Line:

Up trains

6.19 a.m. Hastings to Tonbridge (with connection to Charing Cross)
6.58 a.m. Hastings to Cannon Street (diesel-electric)
7.26 a.m. Hastings to Cannon Street (diesel-electric)
7.36 a.m. Hastings to Tonbridge (with connection onwards via Tonbridge and Sevenoaks)
7.54 a.m. Wadhurst to Charing Cross
8.10 a.m. Hastings to Charing Cross

Down trains

4.20 p.m. Charing Cross to Hastings
5 p.m. Charing Cross to Hastings
5.18 p.m. Cannon Street to Hastings (diesel-electric)
5.29 p.m. Charing Cross to Hastings
6. 3 p.m. Cannon Street to Hastings (diesel-electric)
6.22 p.m. Charing Cross to Hastings

Ramsgate, Deal, Dover & Folkestone (via Ashford):

Up trains

5.29 a.m. Ramsgate to Charing Cross
6.42 a.m. Ramsgate to Victoria (with connecting electric service to Cannon Street at Sevenoaks)
6.54 a.m. Dover Priory to Charing Cross (change at Tonbridge)
7.24 a.m. Ashford to Sevenoaks (with connecting electric service to Cannon Street)

Down trains

4.32 p.m. Charing Cross to Folkestone (calling at Waterloo and London Bridge)
4.54 p.m. Charing Cross to Ramsgate
5.44 p.m. London Bridge to Dover Priory
6.18 p.m. Cannon Street to Sevenoaks electric (connecting with 6.55 p.m. Sevenoaks to Ramsgate

Ramsgate, Margate, Herne Bay & Whitstable (via Chatham):

Up trains

6. 1 a.m. Ramsgate to Victoria (with connecting electric train at Swanley to Cannon Street)
6.29 a.m. Ramsgate to Charing Cross
7.17 a.m. Ramsgate to Charing Cross
7.35 a.m. Ramsgate to Chatham (with connecting electric train to Cannon Street)
8.20 a.m. Herne Bay to Chatham (with connecting electric train to Cannon Street)

Down trains

4.37 p.m. London Bridge to Ramsgate
4.46 p.m. London Bridge to Ramsgate
5.15 p.m. Victoria to Ramsgate (with connecting electric train at Chatham leaving Cannon Street at 5.15 p.m.)
5.45 p.m. Cannon Street to Chatham electric train (connecting with 6.34 p.m. Chatham to Ramsgate)
6.20 p.m. Victoria to Ramsgate (with connecting electric train at Chatham leaving Cannon Street at 6.15 p.m.)

It will be observed that certain of the services are being effected with the aid of electric trains over part of the route involved. The final result will be that between the hours of 7 a.m. and 10 a.m. there will be 14 such services into London (two directly into Cannon Street itself) and between 4 p.m. and 7 p.m. there will be 18 out (two directly from Cannon Street), with five into and four from there by using electric trains for part of the journey.

The coastal passenger may feel himself not well treated compared with the suburban but if, through lack of trains, the suburban services are hopelessly overcrowded punctuality will suffer, to his more serious detriment than can be the case with the plan now adopted. While terminal facilities remain reduced at Cannon Street there is no alternative, in the interests of all business passengers, to working as many as possible of the services as multiple-unit electric or diesel-electric trains, involving no locomotive shunting. If, however, further improvements prove possible, as the working of the new time table is watched, no opportunity will be lost of bringing them about.

Modern Ticket Office at Glasgow Central

Extensive use of glass in frontage of large office

The opening of the new ticket office on April 15 by Sir Ian Bolton, Chairman of the Scottish Area Board, marked another stage in the modernisation of Glasgow Central Station. This development follows closely on the installation of a new scheme of station lighting, the provision of the new Caledonia tearoom and bar, and an up-to-date enquiry office.

The ticket office at Glasgow Central Station is the busiest in Scotland, some 2½ million tickets being issued annually. The main booking hall and the principal ticket windows face the Gordon Street entrance to the station. Ten booking windows are provided and there are five auxiliary windows on the station concourse which will be opened as necessary to cater for the many people travelling to large events such as football matches and race meetings. Work had been accelerated in order to have the new office ready in time for the large number of passengers expected to travel during the Glasgow Spring holiday.

Exterior Design

A modern treatment has been given to the booking office by providing a clear glass front with Hygiaphone booking windows. This gives a more intimate relationship between railway staff and public. The glass front of the ticket office is encased in bronze and teak framing. The front up to counter height is clad with thick clear glass with decorative glass fibre interlayer. The booking counter extends a foot beyond the line of the glass on the public side and forms a convenient shelf for holding handbags and so on. The solid piers and wall surfaces eventually will be clad with blue-grey granite slabs.

To eliminate noise the ceiling has been lined with metal acoustic tiles, and as a further means towards this end, and to provide a comfortable walking surface, the floor of the hall has been tiled with heavy-duty ribbed rubber tiles. This is the first time that tiles of this type have been used in Scotland. Recessed lighting fittings have been provided, arranged as ceiling panels, to contribute to a light and pleasant appearance. The part of the ticket office towards the concourse is of a modern timber design harmonising with the hotel and other buildings in the concourse.

Interior Arrangement

The layout has been designed to ensure maximum efficiency. Bellmatic equipment for the storage of tickets in batteries has replaced ticket racks and four Ultimatic ticket machines have been introduced for the rapid issue of tickets to Cathcart Circle stations and to Paisley, Gourock, and other stations where there is a heavy concentration of local bookings. There are modern tills, ample cupboard accommodation, and immediate contact with the general and accountancy sections situated in the interior of the office.

The greatest possible comfort for the staff has been provided. Clean filtered air is conveyed by ducts to all parts and extract ducts are arranged at suitable positions. The ceilings are lined with acoustic tiles to eliminate noise, and polished decorative veneered timber has been used for the walls and fittings to provide a hygienic and attractive finish. There is a messroom with hot and cold water, steel sink, and electric grill, and there are cloakroom and toilet facilities. Work continues on the modernisation of the booking hall and approaches which, when completed, will harmonise with the new ticket office and effect a notable improvement in the appearance of Glasgow's busiest station.

The work was planned by Mr. M. G. Maycock, Chief Civil Engineer, Scottish Region. The Architect was Mr. J. A. Arthur, Chief Civil Engineer's Department, and the contractors were Morrison, Dunbar Limited.

At the opening, Sir Ian Bolton was accompanied by Sir John Denholm and Mr. Peter Meldrum, Members of the Board, and Mr. G. W. Stewart, Assistant General Manager, Scottish Region, British Railways. The guests included representatives of commerce, travel agents, and the trade unions. The accompanying illustration shows (left to right) Mr. W. M. C. Scott, Stationmaster, Glasgow Central; Mr. S. E. Raymond, Chief Commercial Manager, Scottish Region; Sir Ian Bolton; Mr. Peter Meldrum; Mr. G. W. Stewart; and Sir John Denholm.

Official opening of the new ticket office at Glasgow Central by Sir Ian Bolton, Chairman, Scottish Area Board, on April 15

Questions in Parliament

Station Car Parks

Mr. Harold Watkinson, Minister of Transport & Civil Aviation, in a written statement on April 15, announced plans to relieve traffic congestion in London. He stated that the B.T.C. has plans for increasing the sites available for parking at British Railways and London Transport stations.

B.T.C. Estimates

Mr. David Jones (The Hartlepools—Lab.) asked the Chancellor of the Exchequer on April 16 to what extent the estimate of a £50 million loan to the British Transport Commission, as shown on page 28 of Financial Statement 134, had taken into account the effect of the recent wage settlement between the B.T.C. and the railway unions.

Mr. Jones also asked whether the figure of £52 million shown on page 28 of Financial Statement 134 as loan to the British Transport Commission was for the same annual period as the financial return of the B.T.C. up to December, 1956.

Mr. Peter Thorneycroft, in a written reply to both questions: The figure of £50 million was based on the best provisional estimate the B.T.C. was able to make of its deficit on British Railways revenue account in the calendar year 1957, taking account of improvements in wages and all other factors. The figure of £52 million relates to the advance in the financial year 1956/57, which was in respect of the deficit on British Railways in the calendar year 1956.

BEYER, PEACOCK ANNUAL REVIEW.—In his annual review, Mr. Harold Wilmot, Chairman, Beyer, Peacock & Co. Ltd., comments on the good delivery record of the company. In December, 1955, the company secured an order from South African Railways for 35 Beyer-Garratt locomotives. An essential condition of the contract was a delivery beginning in seven months. The efforts were so successful that the first locomotive was in steam and under test at the Manchester factory a month before contract date. He considers results for the year to be fairly satisfactory and believes that such small decline as there was in 1956 is likely to be recovered in the current year. In the summer of 1956 an agreement was made with the Railway Maintenance Corporation of Pittsburgh, Pennsylvania, for the manufacture and sale of the whole range of their track maintenance mechanical equipment. This is a business which the company believes will grow—not only in this country—as the transfer of the hard physical labour associated with track gang operations to proved mechanical devices is in line with modern trends. To handle this new commitment and related business a wholly-owned subsidiary—Beyer, Peacock Railway Equipment Limited—has been registered.

Contracts and Tenders

British Railways, Southern Region, have placed the following contracts in connection with the East Kent Coast electrification scheme:—

General Electric Co. Ltd.: H.V. switchgear & rectifiers for 32 substations

British Thomson Houston Co. Ltd.: H.V. switchgear and d.c. high speed circuit breakers and d.c. switchgear for 33 track paralleling huts

Hackbridge & Hewittic Electric Co. Ltd.: rectifier equipment for 31 substations

Bertram Thomas (Engineers) Limited: d.c. high speed circuit breakers for 32 substations and 32 track paralleling huts

General Electric Co. Ltd., Coventry: supervisory control equipment for two control rooms controlling 63 substations and 65 track paralleling huts

W. T. Henley's Telegraph Works Co. Ltd.: in respect of approximately 90 route miles of H.V. and pilot/supervisory cables.

The Indian State Railways have placed an order valued at more than £3,000,000 with Japanese firms for the supply of 31,500 sets of railway wheels.

British Railways, Scottish Region, have placed the following contracts:—

R. M. Gibson & Co. Ltd., Glasgow: new diesel repair shop and diesel fuelling facilities at St. Rollox Motive Power Depot, Glasgow

R. McCartney Limited, Glasgow: roof painting work at St. Enoch Station, Glasgow

Edward Gibbon & Sons Ltd., Glasgow: repairs to roof of Perth General Station

James Laidlaw & Sons Ltd., Rutherglen: new staff accommodation, Corkerhill Motive Power Depot, Glasgow

Johnson & Phillips Limited, London: new electric lighting and power distribution, St. Rollox Works, Glasgow.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from India for axlebox liners as follows:—

30,720 liners, steel class II, for axleboxes, IRS & IRC type, to IRS drg. No. W.507 alt. 8 and to IRS specn. No. M.5/54

The issuing authority is the Director General of Supplies and Disposals. The tender No. is P/SRI/16756-G/I. Bids should be sent to the Director General of Supplies and Disposals, Shahjahan Road, New Delhi. The closing date is May 15, 1957. A set of tender documents is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). A photo-copy set can be purchased from the Branch for 14s. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements. Local representation is essential. The reference ESB/10006/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from Portuguese East Africa, for signalling equipment and barriers for four level crossings. The issuing authority is the Ports, Railways and Transport Department, Lourenço Marques. The tender No. is 76/57. A provisional deposit of Esc. 10,000 must be made by tenderers. The closing date is June 17, 1957. United Kingdom firms cannot submit tenders direct but only through firms established in Mozambique whose names are registered with the Stores Department of the Treasury (Almoxarifado de Fazenda), Lourenço Marques. The Branch (Lacon House, Theobalds Road, W.C.1) will, on request, supply the names of local concerns who have expressed their willingness to act on behalf of United Kingdom firms. Specifications are obtainable from the Railway Warehouses, Lourenço Marques, through the local agents of United Kingdom firms interested. No further information is available about this call for tenders at the Board of Trade. The reference ESB/10030/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from Portuguese East Africa, for steel sleepers and rails as follows:—

35,000 steel sleepers

3,360 rails of 12 metres

The issuing authority is the Ports, Railways and Transport Department, Beira. The tender No. is A/CFB/1/1-124/957. The closing date is June 26, 1957. Specifications and drawings are obtainable from the Railway Warehouses at Lourenço Marques through local agents of United Kingdom firms interested. United Kingdom firms are reminded that they cannot submit tenders direct but only through firms established in Mozambique whose names are registered with the Stores Department of the Treasury (Almoxarifado de Fazenda), Lourenço Marques. The Branch (Lacon House, Theobalds Road, W.C.1) will, on request, supply the names of local concerns who have expressed their willingness to act on behalf of United Kingdom firms. The reference ESB/10069/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from India for copper back plates as follows:—

2 copper back plates, flanged, for H class locos. patt. drg. No. 122/BR page 7/D (DGS&D No. 13622) and I.R.S. specn. No. R4/50 (Ref. No. EAI-18344)

2 copper back plates, flanged, for R class locos. W.Rly. loco. drg. No. 133/BR (DGS&D No. 13534) and I.R.S. specn. No. R4/50 (Ref. No. EAI-20273)

The issuing authority is the Director-General of Supplies and Disposals. The tender No. is P/SNI/17652-G/43/IV-57. Bids should be sent to the Director-General of Supplies and Disposals, Shahjahan Road, New Delhi. The closing date is May 10, 1957. A set of tender documents including drawings but not specifications is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). The reference ESB/10021/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, reports that the call for tenders from India for diesel locomotives, reported on page 377 of our issue of March 29, 1957, has been postponed until May 15, 1957.

Notes and News

Metropolitan-Vickers Transformer Department.—Metropolitan-Vickers Electrical Co. Ltd. announces that the postal address of the Transformer Department is now Floats Road, Wythenshawe, Manchester, 23. For cables and telexes, the department will continue to use the Trafford Park address, namely, Metrovick Manchester Telex 66-314.

B.E.T. Omnibus Service Limited.—The ordinary dividend of B.E.T. Omnibus Services Limited is raised to 11 per cent, tax free, for the year ended March 31 last by effectively increasing the final payment from 6¾ per cent to 7½ per cent. The equivalent for the previous year was 10 per cent, tax free, allowing for a one-for-two capitalisation issue last July. The net profit was £456.927 (£452,892) after tax of £370,094 (£354,237).

French Railway Wage Dispute.—Representatives of three main railway trade unions met on April 24 to review the situation after the recent 48-hr. strike. They decided to send a letter to the Prime Minister asking for a committee with power to decide on a general increase of wages and pensions, an improvement in working conditions, and the solution of differential wage claims to be appointed. The representatives of the three unions are to meet again on May 6, and have invited the other unions to join them.

Railway Wheel Plant for Montreal.—The English Steel Corporation Limited and Canadian Steel Foundries (1956), Limited, a Hawker-Siddeley group subsidiary, have announced the formation of a new company in Canada, to be known as Canadian Steel Wheels Limited. The company will manufacture wrought steel railway wheels in Montreal. The erection of new plant on a site adjacent to Canadian Steel Foundries in Montreal will start soon and production is expected to begin in 18 months. Some particulars of the Chairman and President of the newly formed company appear in our personal columns this week.

Birmingham Railway Carriage & Wagon Co. Ltd. Meeting.—At the annual meeting of the Birmingham Railway Carriage & Wagon Co. Ltd. on April 26, Sir Bernard D. F. Docker, the Chairman, presided. In his circulated statement he reported an improvement in the financial results for the year ended December 31, 1956, and further consolidation of the company's position in the field of diesel traction. Whilst stating that the engineering industry was fraught with all sorts of difficulties and that there was still a considerable shortage of steel, he reassured shareholders that the company's financial position was sound, and that he was optimistic regarding its prospects. The home railways took the greater portion of the 1956 production, and while a considerable amount was exported to Nigeria, Malaya, New Zealand, and Ireland, all these countries had very definite ties with the United Kingdom. The report and accounts were adopted.

British Railways Easter Traffic.—During the three busiest days of the Easter holiday, 1,415 long-distance trains ran from the principal London termini carrying more than 488,000 passengers; this is 32,000 more than last Easter. In all, 2,998 additional long-distance trains were

run by British Railways during the Easter period, an increase of 194 compared with last year.

Railway Benevolent Institution.—The annual meeting of members of the Railway Benevolent Institution will be held in Room No. 5 at the Great Western Royal Hotel, Paddington Station, London, W.2, on June 28, at 4 p.m., to receive the report of the Board of Management and to transact the ordinary business of the institution.

Serck at the 1957 B.I.F.—Serck Tubes Limited will be exhibiting at the British Industries Fair two displays of high grade non-ferrous tubing, including tubes designed for the petroleum industry, sugar refining plant and general engineering purposes. Serck Radiators Limited will show several examples of copper brazed assemblies, demonstrating the wide range of applications of the process, together with a range of their smaller types of primary and secondary surface heat exchangers.

British Railways Punctuality Competitions.—The first awards of shields for success in the British Railways punctuality competitions have been won by the London Midland Region and by the Western Region, which were the two Regions showing the greatest improvement in the timekeeping of passenger and freight trains respectively, for the period ended December 29, 1956. The trophies were presented by Sir Brian Robertson, Chairman of the British Transport Commission, at B.T.C. Headquarters on April 25, being received by Mr. David Blee, General Manager, London Midland Region, and Mr. H. G. Bowles, Assistant General Manager (Administration), representing Mr. K. W. C. Grand, General Manager, Western Region, who was unable to be present. The present competitions are based on the performance of all weekday express passenger trains shown in the public timetables and all express freight trains which make journeys of 40 miles or over, respectively. Placing in these competitions is in accordance with the extent to which each Region improves upon its own results for the corresponding period of the previous year. Besides the competitions based on the improvement factor, a competition for absolute punctuality is to start this year. Both trophies, of which the passenger trophy is shown in the accompanying illustration, have been provided by the Commission in consultation with the Design Research Unit, the designs being by Christopher Ironside, M.S.I.A., and the trophies made by Leslie Durbin, M.V.O.

Lisbon Electrified Suburban Services Inaugurated.—President Lopes on April 28 travelled by special train to inaugurate the Portuguese Railways electric services between Lisbon and Sintra and between Lisbon and Carregado; Sintra is the terminus of a 17-mile branch, and Carregado is 27 miles from Lisbon on the main line to Entroncamento and Oporto.

Brush Group Acquisition.—The Brush Group has announced the acquisition from the Asea Company, of Vasteras, Sweden, the equity of Asea Electric Limited of Walthamstow, also trading as Fuller Electrical & Manufacturing Company. The two businesses, with the exclusive representation for Asea, Sweden, in the U.K. will continue as before under the name of Fuller.

Princess Margaret's Voyage in British Railways Clyde Steamer.—In the course of her visit to Glasgow on April 24, Princess Margaret went for a short sail in the Caledonian Steam Packet Co. Ltd. vessel *Maid of Ashton*. Mr. G. W. Stewart, Assistant General Manager, British Railways, Scottish Region, was presented by the Lord Provost of Glasgow, Sir John Banks, to Her Royal Highness on her arrival at Glasgow Central Station. The Princess stood on the bridge as the *Maid of Ashton* sailed down the Clyde from Bridge Wharf.

Acrow-Demag Agreement.—Acrow (Engineers) Limited has concluded an agreement with the German Demag Group whereby Acrow will represent certain Demag-Zug interests in the United Kingdom. This arrangement will widen considerably the Acrow scope in the field of mechanical handling. The equipment handled by Acrow will consist of the full ranges of monorail electric hoist blocks, suspension tracks, and suspension crane systems. The agreement comes into force on June 1, and a range of spares for existing equipment will be available from that date at the works of Acrow (Engineers) Limited, situated at 7, South Wharf, London, W.2.

Channel Tunnel Developments.—The Director-General of the Suez Canal Company, M. Jacques Georges-Picot, visited London recently for talks with officials of the Channel Tunnel Company. The Suez Canal Company, he stated, was making a technical study of the tunnel project, but it would take up to two years to complete. Until that time, there could be no question of investments. He denied reports that the purpose of his visit had been to invest in the project.

Improvements at Immingham and Barrow Docks.—British Transport Docks are to spend £600,000 on the modernisation of the quay cranage and ancillary work at their Immingham Dock and over £250,000 on improving import facilities for iron ore traffic at their Barrow Docks. At Immingham 11 electric cranes with lifting capacities of up to six tons are to be installed at the general cargo quays, Nos. 1, 2, and 3, while at the mineral quay, four new 10-ton grab cranes and two six-ton cranes will, together with four 10-ton cranes recently provided, complete the renewal programme there. All 17 new appliances will operate on a track of 15 ft. gauge and will have a maximum jib radius of 65 ft. They will replace hydraulic cranes of smaller lifting capacity and radius. The layout of the quays will also be modernised by the strengthening of the supports, repaving of the surfaces in concrete and renewal of crane and railway tracks. At Barrow, a scheme has been approved for the reconstruction and modernisation of 340 ft. of quay at berth No. 4 on the east side of Ramsden Dock basin. Two 10-ton electric grab cranes and three railway lines will be provided, and the scheme when completed will make available at berth No. 4 and the adjoining berth No. 3 a continuous quay 880 ft. in length equipped with seven 10-ton grab cranes.

Walker in Underground Tunnel.—The driver of a District Line train saw a man walking along the tunnel between the rails on April 24. He was half-a-mile from Paddington and walking towards Kings Cross. The driver stopped his train and warned the controller by means of his

British Railways trophy for improvement in punctuality; the passenger and freight shields are almost identical

Sir Brian Robertson presenting the passenger punctuality shield, which was won by the London Midland Region, to Mr. David Blee; the Western Region won the competition for freight train punctuality

portable telephone equipment. The driver of a Metropolitan Line train stopped and took the man on board. The man concerned, a railway clerk, was to have appeared at Marylebone Court on a charge of obstruction the next day, but was stated by the prosecution not to be in a fit state to come before the magistrate.

Associated Electrical Industries Limited.—The final ordinary dividend of Associated Electrical Industries Limited for 1956 is 7½ per cent making, with the third interim, 10 per cent on the capital increased by a one-for-three rights issue; two interims totalling 5 per cent were paid on the smaller capital. Trading profits fell sharply to £10,307,614 from £15,320,780 after depreciation of £2,940,456 (£2,281,010). Tax required £5,847,901 (£7,370,653), leaving net profits at £4,459,713. General reserve of the holding company is allotted £1,250,000 (£1,000,000) while the preference dividends take £116,004 (£101,771) and the ordinary distribution absorbs £2,645,000 (£2,081,896), leaving £819,577 (£748,866) to go forward.

Sabotage on G.N.R.(I.).—An underline bridge in Northern Ireland territory between Goraghwood and Dundalk, on the Great Northern Railway Belfast-Dublin main line, was damaged by explosives in the early hours of April 18. The main-line train service was affected as a result. Normal departure times of main-line trains from Belfast and from Dublin were maintained, but because of the interruption to the railway, special road omnibus services were run between Newry Edwards Street Station and Dundalk connecting these trains. Freight traffic was handled without restriction. A further dislocation was caused when a section of the G.N.R. main line between Belfast and Dublin was blown up by explosives near Lurgan, Co. Armagh, on April 26.

Canadian-Built Diesels for Argentina.—The Argentine Ambassador to Canada visited the erection shops of the Montreal Locomotive Works Limited, Montreal, recently to inspect one of the 25 1,800-h.p. "World Locomotives" ordered for the Argentine Railways at a cost of some $6,000,000. The first of these mixed-traffic, 115-ton diesel locomotives, geared for 75 m.p.h., has already been shipped to Buenos Aires and the remainder will follow before the end of June. They are intended for the General Mitre railway. After touring the plant, the Ambassador said that Argentina was embarking on a major rehabilitation of the country's railway system which "suffered the effects of the unfortunate events during a period of 12 years which ended in September, 1955"; 600 locomotives will be purchased, he stated, of which approximately 280 will be manufactured in Argentina and the balance abroad. The Argentine order is the fourth export order for diesel-electric locomotives received by Montreal Locomotive Works since it began, in 1948, the first full-scale production of diesels in Canada. The company delivered 20 units to New South Wales in 1951-52, 48 units to Brazil in 1952-53 and 15 units to Mexico in 1953-54.

Albright & Wilson (Mfg.) Limited.—As part of an internal re-organisation within the group, the manufacturing activities in the past carried on by Albright & Wilson Limited have been transferred to a wholly-owned subsidiary company, Albright & Wilson (Mfg.) Limited. All contracts made between suppliers and Albright & Wilson Limited and all orders placed by Albright & Wilson Limited have been taken over by the new company. There will be no change in the addresses of the offices and works from which the manufacturing activities are carried on, but all communications should now be addressed to Albright & Wilson (Mfg.) Limited. The head office will be at Oldbury, near Birmingham, which will also remain the head office of Albright & Wilson Limited.

Craven Brothers (Manchester) Limited.—The ordinary dividend for 1956 of Craven Brothers (Manchester), Limited, machine tool makers, is 10 per cent (17½ per cent) absorbing £40,250 (£70,437). Profits fell sharply to £54,152 from £127,842 after all charges including tax of £43,000 (£135,000).

Engineering, Marine, Welding & Nuclear Energy Exhibition.—The Engineering, Marine, Welding & Nuclear Energy Exhibition is being held at Olympia, London, from August 29 to September 12 this year. The title of the exhibition, which is celebrating its golden jubilee, has been changed to include nuclear equipment. Many firms manufacturing railway materials will be among the exhibitors.

London Midland Region Road Motor Drivers' Competition.—Mr. David Blee, General Manager of the London Midland Region of British Railways, presented a silver cup to the Region road motor drivers in Dublin, at the Shelbourne Hotel, Dublin, on April 14. The cup was provided by the Company of Veteran Motorists, and received by Mr. G. B. Gray, on behalf of the drivers. The cup is to be awarded annually to the London Midland district showing the greatest percentage reduction in the number of blameworthy accidents yearly over the previous 12 months in the various districts of the London Midland Region. This is the first year of the competition and the London Midland Region road drivers in Dublin obtained a 45 per cent improvement in 1956 compared with 1955. The accompanying illustration shows left to right: Sir Basil McFarland, Member of the London Midland Area Board; Mr. David Blee; Mr. G. B. Gray, General Agent, British Railways, Dublin; and Mr. F. Marsden, Assistant Irish Traffic Superintendent, London Midland Region.

English Electric Issues.—The growth in output of the companies of the English Electric group has exceeded all earlier estimates and continues to call for additional expenditure on buildings and plant and to absorb more working capital, which hitherto has come from the large sums retained in the business and from bank borrowing. At December 29, 1956, the bank indebtedness of the group in Great Britain was £16,250,000. The directors are of the opinion that the time has come when the greater part of this bank indebtedness should be replaced by more permanent capital. They are proposing therefore to raise approximately £16,000,000 by issues of debenture stock and ordinary shares. The directors have decided to offer 3,044,344 ordinary shares of £1 each for subscription at the price of 50s. per share to ordinary stockholders registered at the close of business on April 8, 1957, in the proportion of one new ordinary share for every £5 nominal of ordinary stock then held, fractions of a new share being ignored, except that each holder of less than £5 nominal of ordinary stock is provisionally allotted one new share. Holders of English Electric Co. Ltd. debenture, preference, or ordinary stocks registered at the close of business on April 8, 1957, are invited to subscribe for the £9,000,000 5½ per cent debenture stock 1977/82 at the price of £97 per £100 of stock. The first payment of interest on the stock will be made on December 16, 1957, and will be at the rate of £2 7s. 2d. (less income tax) per £100 of stock.

Commonwealth Welding Conference.—At the British Commonwealth Welding Conference in London and Saltburn on June 17-29, papers will be presented by directors and senior executives of Quasi-Arc Limited, of Bilston, Staffs. Senior staff of British

Mr. David Blee presenting the London Midland Region safe-driving competition award to Mr. G. B. Gray

Oxygen Gases Limited will also be addressing the conference. Among the major purposes of the conference, which will be organised by the Institute of Welding, is exchange of information on the present technical position of the welding processes and their main applications within the Commonwealth: consideration of means of improving the flow of technical information on welding; and emphasis on the contribution which welding can make to development of modern engineering production. The programme will cover new developments, designs and processes, progress in research, the design of welded structures, productivity in relation to welding, and applications of welding.

Rail Excursion for Amateur Photographers.—For the first time the Scottish Region of British Railways is to provide an excursion train for amateur photographers, and prizes will be awarded for the best photographs taken on the outing. The route selected affords the mountain and loch scenery, including Loch Lomond, Loch Tay, and picturesque places such as Killin, Callander and Dunblane. The special cafeteria car train will leave Glasgow Queen Street on May 25, at 9.16 a.m. for Crianlarich, with a special stop at Garelochhead for photographs to be taken, and continues to Killin on Loch Tay, where some hours will be spent before returning via the Braes O'Balquhidder through Stirling to Glasgow Buchanan Street. The train will run slowly over sections of the line well known for the splendid views obtained from the carriage windows to enable photographs to be taken from the train. One of the prizes will be awarded for the best photograph of the train crew.

Forthcoming Meetings

Open currently and until further notice.—British Transport Commission: Historical Exhibition "Transport Treasures" in Shareholders' Meeting Room, Euston Station, from 10 a.m. to 6 p.m. on weekdays, and 2 to 6 p.m. on Sundays. Admission 6d.

May 3 (*Fri.*).—The Railway Club, at 57, Fetter Lane, London, E.C.4, at 7 p.m. Paper on "The beginnings of the London & Southampton Railway," by Mr. K. G. Carr.

May 4 (*Sat.*).—Permanent Way Institution, London Section. Joint visit to Edinburgh and district with Edinburgh Section members.

May 6 (*Mon.*).—"Historical Model Railway Society, at the Headquarters of the Stephenson Locomotive Society, 32, Russell Road, London, W.14, at 7 p.m. Paper on "The Greenwich branch of the S.E.R.," by Mr. O. J. Morris.

May 10 (*Fri.*).—Permanent Way Institution, Manchester and Liverpool Section. Visit to Mersey Tunnel installations, Liverpool. Limited to 20 members.

May 11 (*Sat.*).—Permanent Way Institution, Leeds and Bradford Section. Visit to J. G. Eccles & Co. Ltd., Road Materials and Slag Works, Scunthorpe, Lincs.

May 11 (*Sat.*).—Permanent Way Institution, East Anglia Section, at Ipswich, at 2.15 p.m. Film: "Steel road," by courtesy of the United Steel Companies Limited, Sheffield.

May 15 (*Wed.*).—Permanent Way Institution, Manchester & Liverpool Section. Second visit to Mersey Tunnel installations. Members meet at Georges Dock Building, Pier Head, Liverpool, at 7.30 p.m.

May 16 (*Thu.*).—Model Railway Club, at Caxton Hall, Westminster, S.W.1, at 7.30 p.m. Annual General Meeting.

May 16 (*Thu.*).—Railway Correspondence & Travel Society, West Riding Branch, at the British Railways Social & Recreation Club, Aire Street, Leeds, 1, at 7.30 p.m. Paper by Dr. P. Ransome-Wallis on "Recent experiences on Danish Railways," illustrated by lantern slides.

May 19 (*Sun.*).—Stephenson Locomotive Society. Special train tour to Margate, leaving Victoria Station at 11.58 a.m.

May 21 (*Tue.*).—Railway Correspondence & Travel Society, East Midlands Branch, at the U.C.S. Guild Room, Toll Street, Nottingham, at 7.30 p.m. "The history of Colwick Motive Power Depot," by Messrs. S. Checkley and C. A. Hill.

Railway Stock Market

More hopeful views regarding Middle East developments helped sentiment in stock markets, where values, both in the industrial and gilt-edged sections, moved in favour of holders. Renewed hopes that the bank rate may be reduced to 4½ per cent before long also helped sentiment, but the increased activity in markets failed to extend to foreign railway stocks, which were generally neglected at the same levels as a week ago.

Costa Rica first debentures were 73½, and the ordinary stock changed hands at 25½, while business at 10½ was recorded in Paraguay Central prior debentures. There was again a fair amount of business reported in Antofagasta stocks with the ordinary lower at 30½, compared with 32½ a week ago, while the preference lost a point at 45½. The 5 per cent Bolivia debentures have marked 92.

Brazil Railway bonds strengthened from 5¾ to 6¼; in other directions, Mexican Central "A" bearer debentures receded from 71 to 70½. United of Havana income stock was 8 and International of Central America shares $37½.

Canadian Pacifics moved fractionally lower at $67, but the preference stock strengthened to £58¼ and the 4 per cent debentures also reflected the better trend in sterling securities and gained a point at £70⅞. White Pass shares improved from $21½ to $23½.

In other directions, Nyasaland Railways shares were maintained at 12s. 9d. and the 3½ per cent debentures 60½.

The shares of locomotive builders and engineers showed steadiness generally, and a good feature was a further improvement from 15s. 9d. to 16s. 9d. in North British Locomotive. Beyer Peacock at 43s. 9d. have been steady on further consideration of the financial results. Despite the rather lower profits the maintained distribution of 16 per cent remains covered nearly twice, so the yield of 7¼ per cent looks not unattractive. Charles Roberts 5s. shares have firmed up from 11s. 3d. to 11s. 6d. and business around 29s. 6d. was shown in G. D. Peters. Birmingham Wagon kept at 18s. 4½d. and Hurst Nelson were maintained at 36s. 6d., but Gloucester Wagon eased slightly from 13s. 9d. to 13s. 6d. Wagon Repairs 5s. shares have been firm at 14s. 1½d.

There has been a good rise in English Electric from 58s. 6d. to 60s. The new issues will raise over £16,000,000. They are £9,000,000 of 5½ per cent debentures at 97 and a one-for-five offer of shares at 50s. each to shareholders, which will bring in over £7,500,00. The directors expect to maintain the dividend at 14 per cent on the larger capital.

General Electric shares have moved up from 57s. 6d. to 58s. 3d. and Associated Electrical were 67s. 6d. with Cromptons 5s. shares 16s. 7½d. Vickers eased further to 43s. 9d. and Cammell Laird 5s. shares also receded to 11s. 7½d. on some disappointment with the unchanged dividends. T. W. Ward were good with a fresh rise from 78s. 3d. to 79s. 6d., while B.I. Cables moved up further from 53s. 9d. to 55s. Westinghouse Brake held steady at 41s. and the 5s. shares of the Brush Group strengthened to 7s. 4½d. Guest Keen attracted around 50s. 9d. and there was steady buying of steel shares on yield considerations. United Steel rose sharply to 43s. 6d. and Stewarts and Lloyds to 32s. 9d. Ruston & Hornsby held firm at 31s. 9d. Delta Metal shares were good at 28s. 6d. xd.

OFFICIAL NOTICES

TRAFFIC FOREMAN required by Iron Works, Nr. Sheffield. Apply with full details of experience to Box 325, *The Railway Gazette*, 33, Tothill Street, London, S.W.1.

BRITISH OWNED RAILWAY AND HARBOUR IN TROPICS. JUNIOR DISTRICT ENGINEER required for maintenance of Way and Works and for supervision of New Works. Salary in range of £1,200 to £1,500 according to experience and qualifications. Taxation negligible. Two-year tour with three months' leave. Provident Fund. Excellent opportunity for energetic young man wishing to gain experience and to accept responsibility. Apply Sir Bruce White, Wolfe Barry & Partners, 1, Lygon Place, Grosvenor Gardens, S.W.1. Tel.: Sloane 0431.

CHIEF ENGINEER (CIVIL) required by the IRAQI STATE RAILWAYS on contract for 3 years in first instance. Salary, according to experience, of up to equivalent of £3,000 a year. Free passages. Liberal leave on full salary. Provident Fund. Candidates under 50 years of age, must have had at least 15 years' experience in railway construction, with practical experience of railway survey, location and preparation of schemes and good knowledge of railway operating. They must have had administrative experience in a responsible position in a Railway Engineering Department. Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2B/42251/RA.

DIESEL TRACTION ENGINEER required by Mining Company in WEST AFRICA to assume charge of maintenance, running and repair of diesel-electric locomotives, diesel shunters and wagon stock on privately-owned railway. Applicants should state concisely experience with traction diesels and associated electrical gear in diesel-electric locomotives. State full details engineering qualifications. This is a position of importance and a high salary will be paid commensurate with experience and qualifications. Tours approximately 15 months with liberal leave in U.K. on full salary. Return passage paid. Initial kit allowance, free furnished quarters and medical attention. Contributory Pension Scheme. Life Assurance and Dependants Income Scheme. Write with copies of references stating age, married or single, to Sierra Leone Development Co. Ltd., Dept. E1, City-Gate House, Finsbury Square, E.C.2.

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